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Exploring Catalyst Behaviours

Full Report

A research report completed for the
Department for Environment, Food
and Rural Affairs by Brook Lyndhurst

November 2011

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1 Introduction

The ‘Exploring catalyst behaviours’ project continues Defra’s programme of research designed to develop a deeper understanding of pro-environmental behaviour. The research, conducted by Brook Lyndhurst, Dr Julie Barnett of the University of Surrey and Dr Christine Thomas of the Open University, feeds into the body of evidence that is guiding Defra and other stakeholders in developing policy, communications and other interventions to galvanise public action on the environment.

The aim of the project was to investigate the idea that performing certain pro-environmental behaviours can have a knock on (or ‘catalyst’) effect and lead to the adoption of a broader range of pro-environmental behaviours.

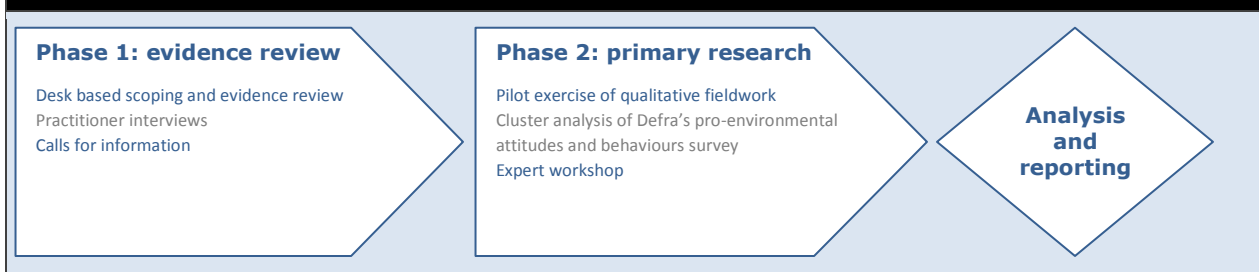
The project explored the following research questions through desk research and a pilot exercise of original qualitative fieldwork:

- (i) Is there plausible evidence that catalyst based behaviour change occurs?
- (ii) If it is observed, how has causality been demonstrated? (i.e. how can we be sure that correlated behaviours are related at a motivational/cognitive/other level?)
- (iii) How does the process or mechanism work (including psychological and sociological factors)?
- (iv) Under what conditions does catalyst based behaviour change occur? Do catalyst effects occur generally, or do they occur for some very specific behaviours, or audiences, or in very specific settings?
- (v) How wide are the spillovers? Do they cut-across apparently dissimilar behaviours or are they confined to sets of behaviours that are mentally categorised in the same way?
- (vi) How can the process be stimulated?

Additional project aims included testing the pilot method as a means of exploring catalyst behaviours and behaviour change; and bringing together the evidence to formulate research questions and hypotheses for further research.

The programme of work involved the following:

Figure 1 Outline methodology



An expert workshop was held following the desk and primary research to feed into the analysis phase of the project. 15 academic and practitioner experts identified through the evidence review were invited to a day long, facilitated workshop. The aim was to bring together the experience and insight of these experts in behaviour change to maximise the insight and lessons learnt from the research. A summary of the expert workshop may be found in appendix 6 of this report.

This report presents the detail of the research evidence and sets out the implications for policy and communications.

- Part 2 of the report presents the findings of the evidence review;
- Part 3 sets out the methodology and findings of the pilot fieldwork;
- Part 4 presents an overview of a cluster analysis performed on Defra's (2007) environmental attitudes and behaviours survey; and
- Part 5 contains a discussion of the evidence and some implications for policy and communications, including ideas for further research.

The research evidence set out in this report should be thought of as laying the groundwork for further research: many questions remain unanswered and more have been raised. The qualitative research with practitioners and members of the public was exploratory and small in scale but nonetheless provides a rich, descriptive starting point for understanding the relationships between different pro-environmental behaviours. The statistical analysis of Defra's Attitudes and Behaviours survey used robust statistical methods but is limited in scope by the cross-sectional nature of the data – causal connections between behaviours cannot be shown in this type of 'snapshot'. This Evidence Report should be read in the light of these limitations.

2 Evidence review

2.1 Approach to the evidence review

The aim of phase 1 of the research was to synthesise and interpret the evidence around catalyst based behaviour change. Our objective was to address the research questions on the existence and processes of catalyst based behaviour change: is there plausible evidence that catalyst based behaviour change occurs; and if so, how? We also aimed to provide a firm foundation for the pilot fieldwork phase of this project and for possible future work (including action based research) in this area.

The evidence review covers material from across the full range of Defra's evidence hierarchy, from peer reviewed journal articles to case studies of varying robustness. This evidence was collected through a desk based evidence review¹, short interviews with academics and 'practitioners' working in the field of behaviour change, and calls for information from two online networks of sustainable development professionals.² Although not a formal systematic review, the desk-based literature search and review were based on carefully designed criteria (see appendix 2 and below); and although evidence was not excluded on the basis of quality, discussion of methodological robustness and validity of findings forms one element of the review.

The evidence review was designed to be completed in two stages: (1) a scoping exercise and initial review; followed by (2) a full in-depth review. The scoping exercise enabled the research team to establish clear parameters for the full review and scope coverage and availability of sources. An initial review of 30 items as part of the scoping exercise allowed us to test the validity of the research questions and the parameters of the evidence to be reviewed. The end of the scoping exercise provided a break point in the review process – a progress report and working session with Defra allowed us to test our 'thoughts in progress' and finalise the parameters of the full in-depth review.

Desk based evidence review

The initial parameters of the evidence review were set around a range of disciplines identified by Defra that related to behaviour change and may have contained evidence about catalyst behaviours:

- psychology (social and cognitive);
- economics;
- sociology;
- marketing (commercial and social);
- behaviour change; and
- the wider environmental sciences.

¹ See Appendix 2 for a list of sources and search terms used during the evidence search

² These were: Fostering sustainable development: community based social marketing listserve (<http://www.cbsm.com/public/world.lasso>) - an international information sharing network of more than 6,200 people; and the Food Climate Research Network mailing list, which goes out to over 1,000 people.

The evidence base from these areas was split into broad themes:

- theory and academic literature;
- marketing (commercial);
- environmental behaviour (including related social marketing literature);
- health behaviour (including related social marketing literature); and
- crime behaviour (including related social marketing literature).

Interviews and calls for information

Evidence was reviewed methodically based on the research framework laid out in our proposal and refined during the scoping phase. However, no review can ever capture everything, especially one covering a wide range of disciplines. To mitigate the risk of omitting important sources and ideas, we also consulted a number of academics working in the fields of psychology, environmental and health behaviour change, commercial marketing and social marketing in order to identify any gaps in our evidence base.

Another important part of the review was gathering evidence that was not written down in ‘conventional’ sources such as journal articles. We thought it fair to assume that not all evidence about catalyst behaviours would be contained in formal, robust sources and that some practical evidence would be buried deep inside project evaluation reports. As such, the experience of practitioners in the field of behaviour change was identified as a potentially important source of information. The practitioners interviewed were selected on the basis of existing contacts from the research team and steering group, as well as desk research to find other community projects involved in environmental behaviour change and other examples of action based research.

See section 2.3 for details of the evidence collected from behaviour change practitioners, including the 20 interviews conducted with behaviour change practitioners during the scoping phase. Appendix 3 contains a summary table of information identified through these interviews.

2.2 Overview of the evidence

Prior to a discussion of the findings of the evidence review, we first set out some background context against which the content of the evidence was assessed.

The conceptual clarity of the idea of ‘catalyst behaviours’

Our interviews and discussions with academics, practitioners and other interested parties suggested that the idea of ‘catalyst behaviours’ is readily understood, highly appealing and frequently endorsed. However, the relative simplicity and coherence of the core idea – that performance of one behaviour may lead to performance of other behaviours - is not matched by consistent language or stable terminology.

There are various close synonyms in the literature for *catalyst based change*: for example, social and cognitive psychology deal with *co-evolutionary behaviours* (e.g. Snijders et al, 2006); health behaviour change practitioners often talk about *co-occurring behaviours* (e.g. Westphal et al, 2007); and the term *double dividend effects* appears in fields as diverse as crime (e.g. Dur, 2006) and energy economics (e.g.

Element Energy, 2008). One of our interviewees had even coined his own term for the phenomenon – *drag effects* (“people get *dragged into* new behaviours”).

Across this range of related ideas, the concept of *spillover* stands out as having one of the most stable definitions across different disciplines, usually referring to the indirect, unintended consequences or side effects of some intervention, event or occurrence. For example, in economics, spillover refers to the side effects or unplanned consequences of economic activity: for example, firms may ‘learn’ and develop thanks to the spillover of a new production technique from an originator firm (in contrast to organisations changing through *learning by doing*, see Jin et al, 2004). Similarly in psychology (e.g. Mullen and Nadler, 2008) and sociology (e.g. Wilson and Musick, 1997), spillover effects are used consistently to describe the knock-on effects (intended or otherwise) of various psychological and social processes.

Spillover effects can be triggered in many different ways (see below), only one of which may be via a catalyst *behaviour*. It is therefore useful to think of the concept of catalyst behaviours as a *particular kind* of spillover effect, unique due to the fact that the catalyst of the spillover process is performance of a behaviour.

What is a catalyst behaviour?

The term ‘catalyst’ itself does not seem to refer to a fixed or clear idea, despite its frequent appearance across the social sciences literature. For example, ‘Family communication: a catalyst for socially desirable behaviours’ (Hopkins, 2005) explores the potential for children to ‘catalyse’ pro-environmental behaviours in their families, but does not provide a definition of what is meant by ‘catalyst’ or operationalise the concept for testing. This is an example of the wider, more general sense of spillover, in that the trigger is not a particular behaviour; instead, it seems to refer to a general transfer of attitudes and behaviours from parents to children. Similarly, from the health literature, ‘Community conversation as a catalyst for stigma reduction and behaviour change’ (Getaneh et al, 2008) shows how community engagement tools helped to change attitudes and behaviours towards HIV/AIDS, but does not explain the mechanisms by which this happened.

It appears that the term ‘catalyst’ is often used in a loose, popular sense, rather than the more theoretical or technical sense of the term as used in the physical sciences³. It is also possible that the variety of terminology has arisen as a result of slightly different interpretations of the core idea being employed in different contexts for different purposes. It is important to note that our particular purpose in this research is to understand whether behaviour change catalysed by action occurs; and if so, the *mechanism* by which it occurs. There is a specific idea embodied in the term ‘catalyst’ that refers to the *process* of catalysis as well as the behavioural consequences. The focus on *how it happens* is especially important from a policy development point of view, since our goal is to understand whether, and how, the process can be stimulated.

Lack of direct evidence

Despite the high levels of recognition of the idea of catalyst behaviours among the people we interviewed, it was striking that very few could provide any concrete evidence in support of their intuitive feeling that catalyst behaviour based spillover does occur.

³ “A substance that increases the rate of a chemical reaction without itself undergoing any permanent chemical change.”

Also, “A person or thing that precipitates an event.” Concise Oxford English dictionary, tenth edition.

This lack of direct practice evidence is mirrored in the academic literature: there is no recognised, general theory of catalyst behaviours in existence, let alone competing theories that can be compared. Thøgersen (2004; 1999) applies the theories of *cognitive dissonance* and *spreading activation* (see section 2.6 for more details) to observed correlations between pro-environmental behaviours; however, this work is not (and does not claim to be) a generalised theory of the spillover mechanism. Kaiser and colleagues (2004; 2008; forthcoming) apply Campbell's paradigm to theorise and test behavioural spillover effects in the environmental arena. See section 2.5.1 for further discussion of both these authors' work.

Similarly, in the 'practitioner' literature (for example, project evaluations and reports and other evidence from 'real life' action based initiatives), projects based on a formal understanding of catalyst effects with supporting data relating to outcomes are rare (although not unknown – see below).

To try and understand the basis of the widespread 'belief' in catalyst behaviours, we turn first to the evidence collected from practitioner sources. The entire range of evidence collected is included, from the most anecdotal snippets to the most robust independently evaluated material (the nature and source of evidence is indicated throughout).

2.3 Practitioner evidence

The research team carried out telephone interviews and email exchanges with 20 practitioners working in NGOs and environmental and community groups who are running projects concerned in some way with promoting pro-environmental behaviours. The aim of these interviews was to tap into grassroots initiatives that may not be able to supply formal evidence of catalyst behaviours, but may nonetheless provide a body of anecdotal evidence to supplement our more formal evidence base.

In addition to the interviews with practitioners, several academics working in the field of pro-environmental behaviour change and related areas were contacted. These academics were selected on the basis of their practical experience of creating and testing hypotheses of behaviour change and/or researching and evaluating practical projects. We also contacted them to ensure that we had not missed any crucial evidence that may not have emerged based on our search terms – we considered it likely that some evidence would be located in obscure sources or categorised or titled in ways that did not obviously capture the topic of interest.

Although most of the practitioners and academics interviewed for this study acknowledged the existence (or potential existence) of a catalyst behaviour mechanism, they could cite little evidence for the existence of catalyst behaviours. This did not, however, prevent the concept from being utilised 'on the ground' - for example, the representative of the organisation Waste Watch commented that, although they had not done any work specifically on catalyst behaviours, they work on the assumption that "people move up the waste hierarchy."

Broad working definitions of 'catalyst'

In relation to catalyst effects, most practitioners referred to behaviour change being catalysed by information, knowledge, 'awareness' or social context rather than particular behaviours triggering the process. For example, one project evaluation report noted, based on participant interviews, that getting

people involved in fundraising for the project was an effective means of getting them to think more about their own home energy behaviours (Cumbria Action for Sustainability in Cox et al, 2009); and WWF are currently conducting research to test the hypothesis that “community engagement is a catalyst for change” (see, for example, Schelle and Pittock, undated).

Knowledge was often cited as an important catalyst of broad behaviour change. Some organisations (e.g. the Energy Saving Trust) combine knowledge based interventions with action based interventions to encourage people to move from one behaviour to another, as these can work together to catalyse further behaviour change. So it seems that the practitioners’ understanding of ‘catalysts’ included the wider context of behaviour change, rather than just the specific process of a particular behaviour leading to other behaviours. Their working definitions included spillover resulting from a number of triggers (for example, “community engagement”), rather than a simple path from one behaviour to more behaviours.

In fact, a number of different types of ‘catalyst effect’ were identified through the interviews with practitioners, including:

- new behaviours catalyse more new behaviours;
- new behaviours ‘spin off’ from existing behaviours;
- behaviours are carried over from one area of life to another (we have called this ‘situational spillover’);
- Feedback spillover; and
- group learning.

Below is a review of a selection of the projects and studies covered by the practitioner interviews that illustrate these different types of catalyst effect. Please see appendix 3 for further details of all the projects.

New behaviours catalyse more new behaviours

Various practitioners reported spillover effects from specific interventions. For example, National Energy Action’s Domestic Environmental Management in Action project⁴ set out to test the effects of ‘strong’ energy and water interventions on energy and water behaviours, as well as on a wider range of sustainable behaviours. They provided participants with energy audits and simple energy saving tools such as draught proofing, energy saving light bulbs and smart meters. Compared to a control group, the survey results showed that after a 12 month period, the 76 participants in the intervention group were not only more likely to have reduced their home energy consumption, but were also significantly more likely to engage in wider sustainable behaviours. The follow up survey showed increases in those reporting more sustainable means of shopping and waste management, with marked increases seen in those reporting purchasing eco-friendly products, composting and buying organic products (see NEA, 2008). The choice of wider sustainable behaviours to include in the baseline and follow up surveys resulted from work with a behavioural psychologist to identify potential spillover effects from energy and water actions. Behaviours that were the focus of other projects in the same funding round were also included.

⁴ see <http://www.swea.co.uk/DEMIA.htm> for details

Other projects found spillover effects from an initial change in behaviour to other *related* behaviours. For example:

- encouraging business people to ‘telecommute’ also affected their non-work travel decisions (Pendyala et al, 1991);
- the OneChange programme in Canada showed that providing people with free energy efficient light bulbs led them to report a heightened concern for energy efficiency in other products;
- another project found that the introduction of a home composting scheme increased participation in recycling (see ERM, 2007).

New behaviours ‘spin off’ from existing behaviours

Through survey data on the waste prevention behaviours of more than 1,450 households, Tucker and Douglas (2007) found self-reported increases in waste prevention activities over a two year period. This was explained by 50% of the sample as simply the next ‘natural step’, rather than as a result of any specific external trigger, suggesting that existing behaviours may provide a ‘platform’ for the adoption of new behaviours. Although most participants could not remember or articulate any specific relationships between their behaviours, the authors do not dismiss the possibility of some kind of catalyst (causal) relationship to explain the change. They suggest that the reason for behaviour change can quickly be forgotten and post-rationalised, and the post-rationalisation may take over the true cause of the behaviour. Overall, they suggest that further research is needed to test these ideas.

This raises an important question about the difference between behaviour change based on ‘natural evolution’ and behaviour change that has been catalysed by the adoption of a specific behaviour. This focuses in on the essence of the question at hand: how can we define and recognise catalyst behaviours and catalyst based behaviour change, and how can we stimulate the process? What is special about the hypothesised catalyst behaviour process that distinguishes it from other types of behaviour change? In the absence of stable working definitions of catalyst behaviours, it is difficult to glean this insight from the practitioner evidence.

Situational spillover

Various practitioners mentioned ‘situational spillover’ from schools to homes. Two organisations had run action based projects on the influence of ‘pester power’ – that is, the effects of pro-environmental initiatives at school (e.g. appointing children as energy monitors, teaching children about eating fruit and vegetables and their relationship with the natural world) spilling over to home life and parents. Anecdotal evidence in the form of a small number of case studies suggests that, in certain circumstances (see below), some children may be effective agents of change by taking home what they learn at school. Case study evidence from another, similar project suggests that school initiatives can also have spillover effects on the home behaviour of the teachers themselves (National Trust in Cox et al, 2009). It should be noted that the evidence from these projects is qualitative and small scale in nature, so any findings would have to be further tested before generalisations could be made.

Another organisation had taken this idea further and investigated the spillover of school environmental programmes not only to home life, but to the wider community (ESRC funded project Social and

Organisational Learning in Action (SOLAR)⁵). At the time of writing, the results of this project were not yet published. The practitioner offered various comments on the programme, including that it was difficult to achieve any depth of insight since there were too many influencing factors. Spillover from school to home was stronger than to the wider community, but both were highly dependent on the socio-demographic and cultural context of the schools and communities; in particular, a 'strong sense of community' was instrumental in enabling spillover from schools to the wider community, which perhaps hints at the importance of social or group learning.

Negative spillover

Very little evidence of negative effects was cited by the community based practitioners – please see the next section for a discussion of the larger body of evidence in the academic literature.

Feedback spillover

Various projects, principally in the area of waste behaviours, have demonstrated a distinct type of 'reverse' spillover, whereby the introduction of a behaviour (e.g. recycling food waste) has had positive effects on participation in an existing, related behaviour (e.g. dry recycling) (e.g. Tucker and Spiers, 2002; Thomas, 2004; ERM, 2007). Another practical example of this comes from Somerset County Council, which provided evidence of increased participation in dry recycling after the introduction of food waste recycling; however, this increase also coincided with a publicity campaign, which makes it impossible to separate the effects of the new (potentially catalyst) behaviour and the informational interventions of the campaign.

Group learning as a catalyst

A common approach used to promote behaviour change that relates to catalyst behaviours involves group activities – encouraging groups or social networks to work together to learn and adopt a range of behaviours. Global Action Plan, WWF and others encourage spillover effects across individuals and across behaviours by working with groups, again with the aim of combining information (such as enabling people to get together to share tips and come up with new ideas) with action. These contexts are designed to encourage the groups to move together from one behaviour to another. However, according to the practitioners, in the context of group learning, rarely is it the case that one specific behaviour catalyses others. There was no evidence from those spoken to that any particular behaviour generally works as a 'first step' from which other behaviours followed – except in the most general sense that people are more likely to adopt easy changes in behaviour before tackling more difficult or extensive changes (see the next section for a discussion of the 'foot in the door' technique).

To what extent does the practitioner evidence address the research questions?

The sum of the evidence from practitioners suggests that various types of spillover may occur in the area of pro-environmental behaviours, including spillover triggered by participation in behaviours. Catalyst behaviours are reported to lead to changes in similar, related behaviours, as well as (more rarely) to a wider range of behaviour. However, it is difficult to draw firm conclusions from this body of evidence, not least because of its anecdotal nature and the fact that measuring spillover effects is often not the primary aim of projects, but more often a secondary observation or an inbuilt (and untested) assumption.

⁵ <http://www.uwe.ac.uk/solar/ARProjects/Details.htm>

Whether as a primary or secondary aim, or as an assumption that is more or less explicit, the idea of catalyst behaviours has rarely been tested. Where it has been studied, it has often not been in such a way as to exclude other explanations of the resulting behaviour change. For example, in the NEA (2008) project that reports wider spillover effects above and beyond the scope of their energy and water interventions, it is difficult to disentangle the effects of the face to face interventions from the direct effects of behaviours on other behaviours. While this still constitutes successful spillover, the real driving forces behind the spillover remain unclear.

Timescale

There is no firm evidence from the practitioners about the timescale required for catalyst effects to occur. Some projects work on the assumption that a continuous process of spillover effects can gradually nudge people along a behaviour adoption curve, whereas others base their evaluations on a one-off data collection exercise that tells us very little about the timeframe of the process. Many studies do not make explicit reference to their timeframe (e.g. Open University and Energy Saving Trust, 2008).

How wide are the spillovers?

Most projects report spillover effects between closely related behaviours, such as different waste or energy behaviours. This relationship between similar behaviours may be significant, but may also be because many organisations have a specific domain of interest (e.g. energy or waste) and so wider effects may go unnoticed. Some projects report wider spillover or transfer between behaviours that are less obviously related. However, in general, specific behaviours are not singled out as causing the others. Practitioners more commonly reported the *co-evolution* of a range of behaviours, with the easiest and least costly behaviours being adopted before the more difficult ones (e.g. Global Action Plan, 2008). This suggests a kind of multifaceted, mutual enhancement at work between behaviours, rather than a simple case of linear causality from one behaviour to others.

Do catalyst effects occur generally or only for specific audiences?

Several practitioners made it clear that patterns of behaviour change are different for different types of people and the same 'catalyst behaviour' will not have the same results for everyone. However, this insight was based on practitioners' personal experience only – no data distinguishing between different groups of people was uncovered.

How does the process work?

Several mechanisms for how catalyst behaviours might work were mentioned by the practitioners, including the importance of individuals coming to see themselves as 'green' and the desire for consistency (for example, one practitioner commented that people do not want to 'waste their effort' in one area by not being green in another). These suggestions for the mechanism of catalyst behaviours were invariably ex-post interpretations of observed patterns of behaviour and have generally remained untested.

Overall, the practitioners' conviction that catalyst behaviours exist is more striking than the actual available evidence. One thing that is clear from the interviews, however, is that no practitioners considered catalyst behaviours alone to be a sufficient condition for behaviour change. Interviewees cited a variety of influencing factors, from the social context to the costs (or difficulty) of both the catalyst and outcome

behaviours. Social context (or the prevailing group norm, or 'community attitudes') was most often mentioned as a key enabling factor in the spillover process.

The evidence gathered from behaviour change practitioners provides some basis for confidence that catalyst processes exist, albeit as one part of a wider, much more complex behaviour change context. However, there seems to be a lack of concrete evidence relating to catalyst behaviours. In the next section we consider what the theoretical and academic evidence can teach us and how far it can go towards filling the glaring evidence gap.

2.4 Evidence from the literature

This section sets out the evidence from the academic and grey literature about spillover in general and catalyst behaviours in particular.

- 2.4 gives an overview of the evidence that exists in support of the spillover/catalyst behaviour model in disciplines other than pro-environmental behaviours;
- 2.5 covers the specific area of environmental behaviour change;
- 2.6 presents a discussion of the processes or mechanisms that may explain *how* catalyst effects come about.

2.4.1. Evidence of spillover from other disciplines

Spillover effects have been observed and tested in a variety of settings, including psychology, sociology and economics. Although most of these studies do not directly investigate *behaviours* as catalysts for spillover effects, they provide a broad background to the general concept.

2.4.2. Psychology

Studies in the wider discipline of psychology (i.e. not environmental psychology – see later for this) typically focus on the behavioural outcomes of spillover at the level of the underlying beliefs and attitudes of research participants; that is, attitudes and beliefs are carried over from one situation to other, unrelated situations, where they are associated with behavioural outcomes. For example, Dickinson and Oxoby (2007) demonstrated the behavioural consequences of the spillover of induced optimism and pessimism. In a two stage lab experiment, they showed that manipulating participants' levels of optimism or pessimism had a direct effect on their minimum acceptable offers in a bargaining game (acceptable offers were significantly lower for pessimistic participants), despite the fact that the game took place *in an unrelated context*. This led the authors to suggest that bias in one's expectations may affect economic outcomes; for example, pessimism about one's initial conditions – such as living in poverty or low financial endowments – may 'spill over' via an individual's expectations to that individual's labour market outcomes.

In a similar vein, Mullen and Nadler (2008) found that exposing subjects to outcomes that violated their moral standards increased those participants' deviant behaviour. In a first study, participants were asked to read an article about a legal trial in which the outcome supported, opposed or was unrelated to their personal moral standards. Where the outcome violated participants' moral standards, those participants were more likely to steal a borrowed pen. In a second study, those asked to recall another person's moral violation were also more likely to cheat on an experimental task, showing that a previous event can cause ripple effects in subsequent situations.

The authors suggest that the reason for this observed spillover effect of witnessing injustice may be that, when institutions and authorities fail to uphold an individual's moral norm, they become less legitimate in the eyes of the subject and so following the rules of the 'system' becomes less important.⁶ This outcome is

⁶ These may be relevant theoretical issues to Defra's ongoing work on 'Public perceptions of short term actions government should take to mitigate climate change'. There are also examples of how this can lead to positive outcomes; e.g. Defra's Small Changes, Big Difference project with Hampshire County Council, designed around Defra's four Es (engage, exemplify, encourage, enable), aligned the 'exemplify' and 'engage' elements of the

also consistent with research into spillover related to the idea of ‘equity with the world’ – perceived unfairness may motivate people to ‘recoup their losses’ at a later time and in an unrelated context (Austin and Walster, 1974). Note again that this study investigates the behavioural outcomes of the spillover of attitudes and beliefs from one situation to other, unrelated contexts (see the section 2.6 for further discussion about the mechanisms of spillover).

2.4.3. Sociology

Sociologists are often concerned with what may be termed ‘situational spillover’ or spillover effects between different spheres of activity. Particularly well studied is the phenomenon of spillover between work and non-work areas of life, which has been explored with regard to effects on parenting (Kirchmeyer 1992), recreation and leisure behaviours (Kremer and Harpaz, 1982; Kirchmeyer, 1992) and volunteering and community work (Wilson and Musick, 1997; Kirchmeyer, 1992).

The processes that are suggested to explain spillover effects between work and nonwork situations include the carrying over and utilisation of *skills* learned at work (e.g. Wilson and Musick, 1997); the tendency to carry work *attitudes* into nonwork domains (see Kremer and Harpaz, 1982); and behaviours or activities being adopted outside work to compensate for poor work quality. This relationship appears to work in both directions, since other studies find the opposite – that workers who experience submission, dependence or frustration at work will adapt psychologically to these conditions and pursue leisure activities that are in line with their adaptive behaviour (see Kremer and Harpaz, 1982; Wilson and Musick, 1997). For example, Wilson and Musick (1997) demonstrated an association between ‘alienating’ work and ‘passive’ leisure time. This contrasts to occupations that demand or encourage the use of initiative, thought and independent judgement at work, which, the research shows, encourage, or permit, social participation, because the latter depends on exactly those skills and characteristics.

2.4.4. Economics

Another discipline in which spillover effects have been studied in detail is economics. In general, economic spillover refers to transfer of innovation between firms; for example, new production techniques pioneered by one firm may *spill over* to others in the same area. Environmental economics provides some evidence of spillover at the behavioural level. For example, Hertwich (2005) investigated the unintended consequences of policy measures taken to protect the environment, in particular in the rebound effects that may be associated with measures to improve energy efficiency. Hertwich argues that these measures may lead to “co-benefits, negative side effects and spillover effects” at the behavioural, technical and system levels. A simple example of negative behavioural spillover is that, as energy production becomes more efficient, energy becomes cheaper, which leads to an increase in demand as people use more of it.

Hertwich suggests several mechanisms of spillover at the household level. One example is the income effect (which may be positive or negative): an increase in disposable income as a result of decreasing energy costs leads to the purchase of other products, which may include more energy-using equipment on one hand, or on the other more positive hand, reallocating the spare income to buy environmentally friendly products such as organic food. This example of ‘top down’ (policy) induced spillover differs from the focus of the current research, which is a sort of endogenous, bottom-up spillover; however, it is a good illustration of the

framework in order to prevent the potential loss of legitimacy suffered by organisations perceived not to be ‘walking the talk.’

principle of the potential snowball effects of interventions (see Herring and Roy (2007) for a discussion of ways to avoid energy efficiency rebound effects).

This example also suggests that the income effect may be a possible mechanism of catalyst behaviours: for example, money saved on bills through energy related behaviour changes or money saved on food by growing your own vegetables, could be diverted to the purchase of environmentally friendly products (positive spillover) or indeed to the purchase of unsustainable goods (negative spillover).

2.4.5. Health

There is a large body of evidence in the field of health and health psychology that suggests that a range of health-related behaviours co-occur. For example, high correlations are observed between excessive smoking and drinking and unhealthy eating; gambling and drug-use; and lack of exercise and poor diet. There is doubt, however, as to whether one behaviour causes/catalyses others. Rather, these behaviours are interpreted as being in reciprocal relationships based on common attitudinal factors. One study (Ross and Thow, 1997) did show that exercise can be a catalyst for a healthier lifestyle; however this was in a very specific circumstance (cardiac rehabilitation) with a very constrained sample (vulnerable patients). Some studies also find evidence of “risk compensation” or negative spillover, where people who exercised were actually more likely to smoke and drink heavily (Poortinga, 2007). There is also some evidence of the ‘feedback’ spillover mechanism, where new behaviours may have a role in further establishing existing behaviours; for example, going out for a drink may reinforce smoking among some people (King and Epstein, 2005).

The issue of gateway drugs provides a parallel to our question of catalyst pro-environmental behaviours, although the gateway drug model focuses on negative behaviours. There is a significant body of research investigating the idea that certain kinds of ‘soft’ drug (e.g. cannabis) can lead on to more serious substance abuse (e.g. cocaine and heroin). Soft drug taking and hard drug taking are frequently observed to co-occur, and often in a temporal order from soft to hard, implying some kind of causal relationship. However, research has shown that this apparent causal path from one behaviour to the other is largely an illusion: other latent variables are generally the most important cause of both types of drug taking (Pudney, 2002; Ritchey et al, 2001). Although some gateway effects exist for some people, the paths are generally highly contextual and tied in so closely to each individual’s personal circumstances, that it is almost impossible to disentangle the gateway effect from the ‘contextual noise’ (Pudney, 2002; Rose, 2009⁷).

2.4.6. Marketing

Finally, the discipline of marketing offers a number of interesting insights that may shed light on the question of spillover, especially with regard to designing action based interventions. There is strong evidence that marketing one or more products under the umbrella of, or alongside, a strong, established brand can have positive spillover effects on the new market entry (e.g. Simonin and Ruth, 1998, 2000; Shine et al, 2007; Greifeneder et al, 2007; Bottomly and Holden, 2001). These techniques are referred to (respectively) as brand extensions and brand alliances and both are premised on the spillover of positive associations from the ‘parent’ brand to the new product.

⁷ Personal communication

Brand extensions and alliances constitute another illustration of spillover effects whereby behaviour change (in this case purchasing behaviour) is achieved by encouraging the spillover (or extension) of positive attitudes and established purchasing behaviours to other related products. Several authors highlight the enabling conditions that must be present for positive attitudes and purchasing habits to the established 'parent' product to be successfully carried over to the new product.

Firstly, the parent and target products must be perceived by customers to *go together* or *'fit'* – there must be some link or relationship between them. So, for example, a new brand of coffee could be marketed alongside an established brand of coffee maker, since these products are likely to be perceived as complementary. Secondly, the company producing and marketing the products must be perceived to have the correct skills or background in the new products: for example, Aaker and Keller (1990) suggest that 'Betty Crocker bicycles' would be likely to fail, due to the perception that the cookery brand, however strong and successful, would not have the necessary skills and experience to move into bicycle production. This point may extend to communications in general, including environmental behaviour communications: it may be that a lack of 'fit' between the messenger and the message could limit the success of campaigns.

Another idea closely associated with brand extensions is the idea of 'completing the set.' Research shows that marketing a group of products together as a complete set can significantly increase sales of each of the related products, for example, a camera plus a same-brand photograph printer plus same brand photographic paper (Shine et al, 2007). Underlying these results is individuals' desire to 'complete the set' or behave consistently with respect to the brand.

The finding that multiple brand extensions appeal to consumers as a complete package may link to the behaviour change strategy of promoting a 'lifestyle package' of behaviours together: by developing a network of associations between a group of behaviours, people could be encouraged to 'complete the set' of pro-environmental behaviours.⁸

Overall, then, evidence of spillover in the broadest sense can be found in a variety of domains. We next turn our attention to the environmental behaviour change literature to explore the evidence on spillover from this domain.

2.5 Spillover in the environmental behaviour change literature

In the context of the wider field of spillover research, environmental behavioural spillover has received little attention. Only a small number of authors have conducted research with the specific aim of exploring environmental behavioural spillover effects.

⁸ This 'lifestyles' approach is explored in Brook Lyndhurst's (2008) evaluation of the Defra Environmental Action fund (EAF) projects and a recent Defra WREP project conducted by Hampshire CC (Hampshire County Council and Brook Lyndhurst). The evidence from these projects suggests that the success of the lifestyles approach can be limited, since people tend to choose the easiest actions and ignore the most difficult. This project may shed more light on why this is often the case; for example, the marketing literature and cognitive dissonance theory suggest that if the full range of behaviours or actions that were part of the lifestyle packages were not sufficiently linked in people's minds (if there was not a sufficiently developed network of associations between the behaviours), spillover as a result of the desire for behavioural consistency would be less likely.

Most of the research into the potential positive spillover effects associated with the adoption of pro-environmental behaviours has been conducted by Thøgersen (1999, 2004; and Ölander, 2003; 2006) and Kaiser (and Wilson, 2004; Kaiser, Byrka and Hartig, 2008; Byrka, Kaiser and Hubner, forthcoming). In addition to these studies that directly investigate environmental behaviour spillover, other studies that have not set out specifically to find spillover effects report them as an additional finding of their research (e.g. Berger, 1997; Barr, 2005, 2007; Daneshvary et al, 1998; Tucker and Douglas, 2006; Open University and Energy Saving Trust, 2008).

2.5.1. Key authors – Thøgersen and Kaiser

A series of journal articles by Thøgersen and colleagues builds the case for the existence of pro-environmental spillover effects and, in general, relationships between different pro-environmental behaviours. The first paper in the series to test a specific formulation of spillover (Thøgersen, 1999) found direct positive spillover effects from recycling to waste prevention activities (such as avoiding packaging); this paper also demonstrated some instances of negative spillover from participation in recycling to a reduction in feelings of obligation ('personal norm') to perform other waste prevention activities. This study analysed data from a single telephone survey (n=1002) using structural equation modelling techniques to test a number of hypotheses relating to spillover:

- Performance of a behaviour increases salience of attitudes towards other behaviours (not supported by data);
- Performance of a behaviour → learning about consequences → change of attitude → change of behaviour (not supported by data);
- Performance of a behaviour increases the salience of general values and attitudes which then spills over to behaviours with similar environmental consequences (not supported by data);
- Performing a behaviour increases likelihood that other activities that can be categorised with this behaviour are performed as well (supported by data).

Thøgersen and Ölander (2003), this time working with a much broader array of behaviours, again found some positive spillover effects, although they were mainly only weakly significant and only in a few of the possible instances. This study (n=828; three survey waves over two years) was based on a questionnaire of 17 items grouped into five behavioural categories:

- buying organic;
- buying green non-food products (e.g. 'environmentally approved shampoo');
- transport;
- conservation (e.g. 'turn off the water when brushing teeth'); and
- recycling.

Between the recycling, transport and buying organic categories, four significant spillover paths were observed⁹. Two of these indicated positive spillover effects:

⁹ Structural equation modelling was used to isolate the effects of the level of participation of behaviours during the first wave on the levels of participation during subsequent waves.

- high levels of recycling was associated with an increased tendency to purchase organic food;
- participants who reported recycling most in the first wave decreased their use of public transport and/or bicycle less than average over the subsequent two years.

Negative effects were found between high levels of buying organic food and a less than average increase in recycling. However, it seems that this may be explained by a possible ceiling effect – those people who bought organic most also recycled most from the outset, so had less room for improvement.

It is interesting to note that this study was conducted over a decade ago, when recycling was less normalised than it is now and as such was much more diagnostic of a ‘green’ attitude. It would be interesting to repeat this experiment in the current social context, where recycling is a much more common behaviour and much less diagnostic of green attitudes. There is some evidence that recycling may in fact be a cause of negative spillover by virtue of providing people with an ‘alibi’ for not participating in other, more difficult pro-environmental behaviours (Tucker and Douglas, 2006; anecdotal evidence from practitioners – see sections 2.3 and 2.5.3).

In work published in 2004, Thøgersen applied the theory of cognitive dissonance to correlations between pro-environmental behaviours and found that, once measurement error was controlled for, the data provided support for the theory that individuals strive for consistency across related behaviours. However, the work shows that the influence of ‘idiosyncratic conditions’ and the use of fallible measurement tools (in particular self reported survey data) often suppress these correlations. In other words, academic studies often find no relationship between behaviours where relationships do exist, since relationships remain undetected due to contextual ‘noise’ and inaccurate measures.

Kaiser and colleagues (2004; 2008; Byrka et al, forthcoming) also hypothesise a frequent type 2 error in spillover research (that is, a false negative result) and postulate that the cause of this common error ‘stems from a methodological omission’ (Byrka et al, forthcoming). The nature of this omission is that traditional measurement approaches and modelling techniques do not factor in the variability in performance difficulty or cost of the different behaviours for different people in different situations – that is, behaviour or situation specific constraints are not the exception in the field of pro-environmental behaviours, but the rule.

For this reason, Kaiser and colleagues base their ongoing research on Campbell’s paradigm; that is, they conceptualise behaviour as a function of one’s attitude toward the behaviour and the costs of that particular behaviour. Based on this conceptualisation, they confirm the link between ‘general attitudinal dispositions’, specific attitudes and multiple related behaviours.

Within this framework, Bryka, Kaiser and Hubner (forthcoming) seem to have more success in observing wide ranging pro-environmental behavioural spillover. Their latest work is based on a large set of behaviours taken from Kaiser and Wilson’s (2004) General Environmental Behaviour Scale, which contains a large range of pro-environmental behaviours, from “I bought solar panels” to “After a picnic, I leave the place as clean as it was originally.” This research found that interventions designed to encourage energy saving behaviours had spillover effects on ecological behaviours from other domains, including ‘buying products in refillable packaging’ and ‘buying meat with eco-labels.’

The strongest spillover effects were triggered by face to face interventions on home energy use, during which participants' houses were energy audited and participants borrowed an energy meter. Compared to groups who received interventions based on written information and no intervention at all, after one year, significant changes in behaviours across a range of a loosely defined class of 61 'ecological behaviours' were observed among the participants in the face to face intervention. This study thus provides evidence of spillover from an event (an intervention) to wider behaviour change. However, it is difficult to draw any firm conclusions regarding the effect of prior behaviour patterns on subsequent behaviour patterns, due to self selection bias in the group where most 'spillover' was observed (participants actively chose to take part in the intervention and, furthermore, had to pay to do so). Additionally, the effects of the face to face persuasion technique are highlighted by the authors as a likely cause of the spillover, rather than participating in the behaviour per se.

To explain the observed spillover, the authors hypothesise that participating in an action influenced participants' 'general environmental attitude', which in turn affected subsequent behavioural choices. However, the focus of this research is on the persuasive techniques used to encourage the energy saving trigger behaviours, with face to face persuasive techniques found to lead to the widest spillover. Performance of the catalyst behaviour is only part of the story, and the way in which the catalyst behaviour itself is triggered is a key factor in whether spillover takes place. There are other important explanatory factors in the observed spillover; for example, the group where most spillover was observed was found to have stronger pro-environmental attitudes and values to start with. This evidence suggests that the wider context of spillover, such as the target audience and the type of intervention, is at least as, if not more, important than the relationships between the behaviours themselves.

Despite meta-reviews of the literature¹⁰ concluding that there is no firm evidence for spillover (e.g. Gray, 1985), Thøgersen, Kaiser and colleagues provide some (albeit ambiguous) support for the idea that certain behaviours can be a source of spillover to other behaviours. Both explain the lack of evidence on the basis that the relationships between behaviours are attenuated by behaviour specific constraints (costs, difficulties) and the use of fallible measures (self reported survey data), which often leads to findings of no spillover effects.

It seems possible that these difficulties in measurement and modelling have precluded the growth of research into spillover and led to a situation whereby researchers are forced to rely on an unsystematic body of evidence, often drawn from research whose primary aim was not to demonstrate spillover. Below, we review this further partial evidence that can be found scattered throughout the literature.

2.5.2. Other circumstantial evidence

A number of sources provide clues that point to the existence of relationships and potential causal links between different pro-environmental behaviours. These studies report that individuals who participate in a particular pro-environmental behaviour (e.g. recycling) are also those who are likely to participate in a wider range of behaviours (see for example Daneshvary et al, 1998, cited in Barr, 2007). However, since they generally do not set out to show spillover effects, a causal, catalyst mechanism between these co-occurring behaviours is more often suggested rather than tested.

¹⁰ That is, reviews of reviews

Various studies have found strong correlations between different types of waste behaviour (e.g. Tucker and Douglas, 2006), particularly between recycling and other behaviours (both waste and more general behaviours) (e.g. Berger, 1997, Barr, 2005; 2007). Berger (1997) argued that recycling was a ‘first step’ to catalysing other pro-environmental consumer behaviours such as water and energy conservation¹¹. After observing correlations between these behaviours, the author suggested that recycling’s visibility, ease and low cost may create a social norm from which other pro-environmental behaviours could flourish. More recently, Barr (2005, 2007) has suggested a ‘snowball effect’ and ‘behavioural chain reactions’ with regard to some household waste management behaviours, amongst which he finds high levels of co-occurrence.

A number of studies of waste behaviours suggest that behaviours that seem to *go together* under the category of ‘waste’ often have very different motivational roots. For example, waste prevention activities are found to be perceived as fundamentally different to recycling behaviours (see Barr, 2005 and Tucker and Douglas, 2006). Through large scale survey work, Tucker and Douglas also show that the separate category of waste prevention behaviours can be further subdivided into distinct types of behaviour such as reuse behaviours and point of purchase behaviours. This suggests that behavioural category structures can be complicated and may not always correspond to an ‘expert’ view.

Some studies have explicitly investigated the effects of interventions. For example, in a study of home energy behaviours, the Open University and Energy Saving Trust (2008) surveyed participants in a microgeneration programme (n=900) and found that three quarters reported heightened awareness of their home energy use, which they reported to have caused changes in their behaviour in order to make the most efficient use of the hot water and heat generated from their microgeneration equipment. Similar effects were found by the Sustainable Consumption Roundtable, which showed that microgeneration made energy more visible and provided a “tangible hook to engage householders emotionally with the issue of energy use” (Sustainable Consumption Roundtable, 2006). Dobbyn and Thomas (2005) also found some qualitative evidence of catalyst effects during interviews with a small number of individuals whose social housing development contained microgeneration technology. The interviews suggested that exposure to microgeneration technology increased awareness of energy issues and caused some energy behaviour change. In contrast, Element Energy (2008) presented evidence that, although installing microgeneration had led to increased awareness of energy use, this had not translated into significant behaviour change (n=110; self reported via telephone survey).

The clues derived from these papers are important. They provide evidence that pro-environmental behaviours often co-occur and it remains the case that co-occurrence may indicate a causal relationship between behaviours. However, it could also indicate an underlying independent variable, such as a particular set of values, that is a common cause of all the co-occurring behaviours, and no direct causal relationship from previous behaviour to future behaviour exists.

Although spillover is not unequivocally shown, it does remain a possible explanation for observed correlations and clustering of pro-environmental behaviours. It is therefore worth continuing the investigation by exploring potential mechanisms of how the process might work. However, before we

¹¹ Note that this may be subject to the same caveat as other research on recycling: a decade ago, recycling was not yet normalised to the degree it is today, and so was more diagnostic of green attitudes. Now that recycling is a much more common behaviour, it may no longer play the role of a ‘first step’ to other ‘environmental’ behaviours; and even if it did, its high levels of uptake could possibly make this difficult to identify.

explore the nature of the possible causal mechanism, it is important to briefly look at the other side of the catalyst behaviour coin – negative spillover.

2.5.3. Negative spillover

It is interesting to note that some of the most convincing evidence of spillover effects between pro-environmental behaviours relates to negative spillover. This evidence is important because (a) it may help us to understand better how positive spillover works; (b) the presence of spillover provides further evidence that structural relationships do exist between some pro-environmental behaviours; and (c) this type of ‘trading off’ of behaviours suggests that they may be perceived to have a *common goal*, which may give us a clue as to the perceived relationships between the behaviours (see e.g. Kaiser and Wilson, 1994; Thøgersen and Ölander, 2003).

Frey (1993) studied the effects of offering monetary rewards for performing ‘altruistic’ behaviours such as caring for the environment and donating blood. The key finding of this study was that offering a reward for performing a pro-environmental behaviour can ‘crowd out’ (or suppress) intrinsic motivations for performing the behaviours for their own sake.

When a behaviour is ‘commercialised’ (i.e. financially incentivised), those who already performed that behaviour may perceive that their intrinsic motivation for performing that behaviour is not being recognised. They may also feel that their self determination is being undermined. As an example of this, Frey cites the sale to firms of emissions or effluent permits, or ‘licenses to pollute.’ The sale of the permits allowing a specific amount of pollution suggests that polluting is not morally condemned and that “once a license has been granted, a ‘license to pollute’ has been acquired”. In other words, the introduction of a pricing mechanism has ‘crowded out’ the intrinsic motivation for caring for the environment. According to Frey, since people often perceive the environment as a whole, and since the expectation of payment has undermined the original intrinsic, altruistic motivation, the ‘crowding out effect’ can spill over to other related behaviours where no price is offered.

This conceptualisation of spillover suggests that motivation is the mechanism through which attitudes and behaviours carry over to other arenas. This in turn suggests that the likelihood of (negative) spillover is higher between behaviours that are most similar to each other at a motivational and/or categorical level. This research highlights the risks discussed by other researchers across a range of disciplines of unintended negative consequences of ‘top down’ interventions. It also highlights the importance of including an actor’s motivations and values in any conceptualisation of spillover.

The literature provides mixed evidence of negative ‘carryover effects’ (Bratt, 1999) among pro-environmental behaviours. Some studies find that recycling in particular seems to ‘absolve’ individuals from an obligation to act in other areas, perhaps by making them think that recycling solves the waste problem or ‘compensates’ for not doing other things (Barr, 2007; see also Thøgersen, 1999; Bratt (1999); see Midden et al, 2007 for a discussion of compensatory non-waste behaviours, namely not using your tumble dryer to ‘compensate for’ driving to work). On the other hand, Bratt (1999) hypothesised that individuals may use certain behaviours such as recycling as an ‘alibi’ for not acting in other areas, but through survey data (n=1500) found that increased recycling activity did not lead to compensatory behaviour patterns and did not increase the likelihood of individuals perceiving recycling as a compensatory behaviour.

This mixed evidence may be due to the fact that only one study set out to investigate negative effects (Bratt, 1999), whereas the others reported it as a side effect of the main study. It is likely also to be due to methodological inconsistencies between studies and lack of a firm theoretical foundation of how spillover works. For example, a lack of longitudinal data in general hampers any discussion about spillover effects over different time periods. Most importantly, it is likely that the possibility of spillover (either positive or negative) depends on a specific set of circumstances in every different case, and it is therefore not possible to make *ex ante* generalisations about the effects of one behaviour on another (Frey, 1993).

2.5.4. Overall comments on the existing evidence for spillover

With every researcher working with a different definition of spillover and using different measurement techniques, it is hard to form a coherent overview of the existing evidence. Furthermore, the evidence often does not focus on the relationships between specific behaviours, but more on the general enabling conditions, such as the social context, that increase the probability of the uptake of multiple behaviours.

This body of evidence does not provide overwhelming evidence for the existence of catalyst behaviours (i.e. behaviours that trigger spillover). However, it does illustrate that pro-environmental behaviours often seem to be related to each other - although not always and sometimes in unexpected ways.

An important question relating to catalyst behaviours is whether they are simply a post-rationalisation of observed correlations or whether there is some theoretical underpinning to the process. Some authors have interpreted observed correlations within the framework of psychological models that may explain those correlations in terms of catalyst effects (e.g. Thøgersen, 2004). The next section gives an overview of the possible theoretical models and processes that, according to Byrka et al (forthcoming), provide 'circumstantial evidence' or some intellectual basis for the existence of spillover effects.

2.6 The mechanism of behavioural spillover

The health and crime literatures provide copious evidence of co-occurring or co-evolutionary behaviours; examples include gambling, alcohol and drug abuse (e.g. Westphal and Johnson, 2007) and delinquent/anti-social behaviour and substance abuse (e.g. Tubman et al, 2004). These cases suggest that reciprocal or reinforcing relationships exist between certain types of behaviour.

Co-occurrence can be an indicator of a common underlying cause. In most of the health and crime literature, co-occurring behaviours are investigated in terms of their reinforcing effects on each other; but more importantly for health professionals and policy makers, they are explored in terms of the underlying variables, such as 'poverty', which are often found to be the common cause of both/all outcome behaviours (e.g. Pudney, 2002; Ritchey et al, 2001).

The importance of underlying or background characteristics is echoed in the environmental behaviour change literature, where, for example, years of schooling is often found to be a powerful underlying explanatory variable of behaviour (e.g. Arbuthnot, 1977; Thøgersen and Ölander, 2006). This suggests that any model or theory of behavioural spillover must take into account underlying variables that may be important in explaining why certain behaviours are observed to co-occur. Importantly for the question of catalyst behaviours, these examples highlight the importance of establishing the true drivers or causal mechanisms of behavioural spillover.

A number of social psychological models of behaviour emerge from the literature in support of the hypothesis that pro-environmental behaviours tend to function as catalysts for new behaviours (i.e. that pro-environmental behaviours tend to spill over into other behavioural domains). However, most have not yet been fully explored or operationalised. As Byrka et al (forthcoming) suggest, their sum provides only circumstantial evidence, rather than tested and verified proof, of the existence of spillover effects. Below, we consider the most important of these models and processes and offer our interpretation of how they may be relevant to the question at hand.

2.6.1. Social psychological models

Cognitive dissonance theory (Festinger, 1957)

Cognitive dissonance refers to the unpleasant feeling brought on by holding self-contradictory attitudes or behaving in an inconsistent manner. There are various ways in which people may try to neutralise cognitive dissonance, including reducing the importance of the dissonant items; formulating a justification for their actions (including denial of control); or *changing their behaviour* to achieve consistency (e.g. Thøgersen, 2004; Dickinson and Oxoby, 2007).

Adopting a new attitude or behaviour (e.g. trying to use the car less) may create dissonance with other attitudes and behaviours (e.g. going on holiday by plane) and this may lead to changes in behaviour to reduce the dissonance. Note that the change could be anti-environmental as well as pro-environmental – the individual could potentially give up the pro-environmental behaviour in order to reduce the dissonance. By definition, dissonance and the resulting desire for consistency depends on a *perceived* interrelationship between the behaviours in question – no dissonance or inconsistency would be caused by unrelated behaviours.

Self perception theory (Bem, 1972)

The theory of self perception postulates that in ambiguous situations (where, for example, a personal norm is yet to be formed about a topic), individuals infer their attitudes by observing their own behaviour. If individuals observe themselves performing a pro-environmental behaviour, they may ask themselves the question “What must my attitude be if I am prepared to behave in this fashion?” This may cause the individual to align their cognitions (e.g. beliefs, attitudes, values and self image) with the behaviour they observe themselves performing – “If I’m willing to recycle and switch my appliances off standby, I must have a pro-environmental attitude”. The ascription of a pro-environmental attitude to oneself may provide the basis for further behaviour change to reduce dissonance between the pro-environmental attitude and other un-environmental behaviours. The self perception model also provides an explanation of how action can precede and inform attitudes, especially when strong personal norms have not yet been formed.

Strongly linked to the theory of self perception is the idea of **self identity/self concept**; people coming to see themselves as ‘green’ is found to be an important antecedent of behaviour in the literature (e.g. Sparks and Shepherd, 1992; Dietz et al, 2005; Hogg and White, 1999) and was often mentioned during interviews with practitioners. A parallel can be found in the health psychology literature, which suggests that coming to see oneself as ‘a healthy person’ may be a crucial step in developing a healthier lifestyle (e.g. Department of Health, 2008).

Norm activation theory (Schwartz, 1977)

This theory postulates that altruistic (including pro-environmental) behaviour occurs in response to personal moral norms that are activated when an individual believes (1) that particular conditions pose threats to others (awareness of adverse consequences) and (2) that actions they could perform could avert those consequences (ascription of responsibility to self).

Participating in a behaviour could increase both ascription of responsibility to self as well as the personal salience (awareness) of the consequences of that behaviour and related behaviours. The increase in both awareness of consequences and acceptance of personal responsibility may lead to the development of a personal moral norm based on that behaviour. The newly activated personal moral norm could then provide the foundation for adoption of other behaviours that are perceived to be related to the original behaviour, perhaps through the extension of an awareness of the consequences and an acceptance of personal responsibility regarding other, related behaviours.

Self efficacy (Bandura, 1977)

Self efficacy is the belief in one’s ability to succeed in specific situations and can therefore have a direct effect on behavioural choices. People are more likely to engage in behaviours that they think they can do, and may have stronger motivations to perform a behaviour and persist in doing that behaviour, whereas low self efficacy can be a psychological barrier by making tasks seem more difficult than they actually are.

Bandura singles out personal *experience of a behaviour* as the most important factor determining an individual’s self efficacy in relation to that behaviour. It seems possible that increased self efficacy in relation to one behaviour may spill over to other related behaviours – “If I can do behaviour A, then I’ll probably be able to do behaviour B too.” Self efficacy and similar ideas frequently emerge in investigations of inter-related behaviours and behavioural progression in the pro-environmental arena (e.g. Osbaldiston and

Sheldon, 2003; Velicer et al, 1998; Dietz and Schwom, 2005; Gardner and Stern, 1996). It also emerges as a key concept from the health and health psychology literature (e.g. Ussher et al, 2000; Department of Health, 2008; Strecher et al, 1986; Ross and Thow, 1997) and may help to explain the spillover of skills from work to leisure time (Kremer and Harpaz, 1982; Kirchmeyer, 1992; Wilson and Musick, 1997; Kirchmeyer, 1992).

Transtheoretical model (Velicer et al, 1998)

The transtheoretical model of behaviour change centres on the *stages of change* and the *processes of change*, which function as a cognitive and behavioural ‘conveyor belt’ that facilitates change. The model brings together emotions, cognitions and behaviour and employs the ideas of self efficacy and self image. Importantly, it postulates that ‘experience’ or behaviour based processes of change are only effective in the later stages of behaviour change – that is, a certain state of ‘willingness’ or awareness must have been reached before performing a behaviour can catalyse future behaviour.

Theory of planned behaviour (Ajzen, 1985)

The theory of planned behaviour sets out the antecedents of behaviour as:

- the subjective norm, that is, the perception that significant others support this action;
- perceived behavioural control – one’s perceived ability to perform the behaviour with respect to both internal and external barriers); and
- attitude - the individual’s positive or negative evaluation of the action.

These factors are sufficient to create behavioural intention, which, under the right conditions (i.e. in the absence of external constraints), can then lead to action.

Note the similarity between the concepts of *perceived behavioural control* and *self efficacy*: by performing an action, an individual may increase their perceived behavioural control with regard to that specific behaviour and this may spill over to related behaviours. It has also been established that attitudes based on personal experience are stronger and more salient than other attitudes (Fazio, 1986 – see below). This indicates that performing a behaviour may also feed into the attitudinal antecedents of future intentions towards the original behaviour and other behaviours related to it.

Learning models

Thøgersen (1999) suggests that behavioural spillover may occur as a result of a ‘learning by doing’ mechanism. Economic theory states that a firm can reduce production costs through learning by doing (Jin et al, 2004); it may be the case that the same applies to individuals - by drawing on past experience and the skills and knowledge gained by performing a behaviour, the ‘cost’ (or difficulty) of performing new, *similar* behaviours may be reduced.

Kaiser and colleagues (and Wilson, 2004; Kaiser et al, forthcoming; Byrka et al, forthcoming) conceptualise behaviour as a function of one’s attitude to that behaviour and the cost of performing that behaviour, so it is possible that reducing the cost (or difficulty) of a behaviour through learning could increase the likelihood of adoption. If the learnt skills or knowledge were also useful for other behaviours, then spillover effects could occur. A learning model may also help to explain why past behaviour remains the strongest predictor of future behaviour (Aarts and Verplanken, 1998; Verhoef, 2005; Biswas et al, 2000; Knussen and Yule, 2008).

Where acquired skills and knowledge (or ‘know-how’) are hypothesised to be important, they are often found to be a necessary but insufficient condition for the adoption of further behaviours. Added to the new skills must be a mixture of variables that account for one’s ‘taste’ for adopting the new behaviour (Wilson and Musick, 1997; see also Velicer et al, 1998, on the transtheoretical model and the stages of change). The new skills and a certain existing ‘state of readiness’ (perhaps comprising existing beliefs and values) must come together to create sufficient conditions for the catalyst effect.

Foot in the door

The *foot in the door* approach (Freedman and Fraser, 1966), although not strictly a psychological mechanism, is a behaviour change technique that is related to some of the theories above, in particular to consistency theories such as cognitive dissonance. The approach is based on the hypothesis that by asking individuals to comply with an initial small request, the likelihood of them complying with a subsequent larger request is increased. There is evidence for the success of this technique in fields as diverse as organ donation (Girandola, 2002) and organisational behaviour (Herbout et al, 2008).

The evidence suggests that *foot in the door* works by increasing commitment towards a final goal, which echoes the commitment strategies found in social marketing (e.g. McKenzie-Mohr and Smith, 2005). It is possible that, once set on a path towards the goal, an individual is unwilling to waste the effort they have already put in and, through a desire for consistency, continues on the path towards that goal. The choice of initial behaviour is important, since, if it is too easy, the desired effect is not achieved (Herbout et al, 2008). In contrast, an initial request that is too difficult may put off the individual.

The idea embedded in the *foot in the door* technique is known as ‘goal directed behaviour’ and is an important idea for catalyst behaviours. Kaiser and Wilson (2004) suggest that a common goal may constitute the underlying relationship that links different pro-environmental behaviours. This links to self perception theory, since an individual who observes themselves making increasingly demanding steps to achieve a goal (as is the aim of *foot in the door*) may be more likely to infer that they have a positive attitude towards that goal.

Summary of possible mechanisms

These psychological models and processes suggest a number of mechanisms through which performance of a behaviour may catalyse other behaviour(s) at the level of individuals:

- desire for consistency;
- altered self identity;
- altered self efficacy;
- altered personal (moral) norms;
- altered attitude (i.e. by fostering a more positive evaluation of the trigger and outcome behaviours);
- increased skills and knowledge.

All these mechanisms are likely to be subject to situation-specific constraints – for instance, some people or groups of people may have a pre-existing barrier to the identity of ‘environmentally friendly person’ and so

highlighting behaviours as environmental may put some people off. This suggests that a targeted approach is as important for catalyst behaviour interventions as it is for any other behaviour change.

These psychological models and mechanisms are based on conscious processes that are available to the individual for reflection and analysis. However, we know that not all of our behaviour is reasoned and conscious – for example, habits are often conceptualised as automatic behaviours that occur in response to situational cues and bypass the deliberative process. It is not certain that the catalyst process, if it occurs, is a conscious, deliberative process; it may be partly or even fully subject to unconscious forces.

2.6.2. Unconscious, pre-conscious and automatic behaviour

Experiential vs rational thinking: habitual behaviours

It has been repeatedly shown that two different types of cognitive processing can be distinguished: rational thinking (modelled by expectancy-value theories such as the theory of planned behaviour) and experiential (or pre-conscious) processing (e.g. Fazio, 1986; see Woodside and Chebat, 2001 for a review). Research has shown that pre-conscious processing can affect behaviour (see Woodside and Chebat, 2001) and this idea is used widely in marketing and advertising (see e.g. Greifeneder et al, 2007).

Closely linked to the idea of pre-conscious processing is the large literature on habitual behaviours. This literature suggests that the deliberative process described by the theory of planned behaviour and assumed by other psychological models can be bypassed and attitudes and behaviours can be automatically activated by situational cues (e.g. Aarts and Verplanken, 1998; Klockner and Matties, 2004).

Habits and other pre-conscious and automatic elements of behaviour are sometimes thought to block spillover (e.g. Thøgersen and Ölander, 2003; Klockner and Matties, 2004) by bypassing the deliberative processes of behavioural decision making. However, as the marketing profession is well aware, pre-conscious processing may also represent an inroad into behavioural choices. For example, highlighting the environmental friendliness of an existing habit may increase the likelihood of individuals coming to see themselves as ‘green’ or ‘the sort of person who makes green choices’. Cornelissen et al (2008) call this ‘positive cueing’ of behaviours in order to make them more diagnostic of pro-environmental attitudes and self image. For a practical example of positive cueing (in this case the positive cueing of waste behaviours as pro-environmental) see Brook Lyndhurst’s (2008) work with Waste Watchers in the Defra ‘Links’ project¹².

According to Aarts and Verplanken (1998), situational cues activate the most accessible mental structures. This explains how a behaviour can become automatic – repetition of the behaviour increases its mental salience and accessibility, which allows us to bypass a complicated decision making process every time a common situation arises. Instead, we use our past experience and tried and tested behaviours as a model. This insight into the importance of the *accessibility* of a behaviour has implications for spillover between behaviours: by fostering associations between the habitual behaviour and other behaviours (e.g. through communications campaigns), the situational cue that triggers the initial behaviour could potentially also trigger a number of related behaviours.

¹² Brook Lyndhurst (forthcoming 2009), Public Understanding of Links between Climate Change and (i) Food and (ii) Energy Use. Brook Lyndhurst for Defra.

An insight from the world of marketing may provide a clue as to the likely role of pre-conscious processing. Marketing research shows that ‘systematic’ or reasoned processing can lead to the development of ‘deeper’ attitudes and stronger associations between two objects (Aaker and Keller, 1990; psychologists distinguish between ‘systematic’ and ‘heuristic’ processing, suggesting that the former leads to more embedded attitudes, e.g. Griffin et al, 2002). Similarly, Thøgersen (2006) suggests that, when the consequences of action are not obvious, the deeper reasoning required to make a decision may result in the development of stronger personal norms. Finally, marketers use retrieval cues to remind shoppers of advertisements and to make their product more salient, in an attempt to gain an inroad into habitual purchasing behaviours. All this suggests that bringing habitual or automatic decisions to the forefront of people’s minds may be an effective way of stimulating thought and encouraging spillover.

Spreading activation (Collins and Loftus, 1975) and Fazio’s theory of attitudes (Fazio, 1986)

Linked to ideas about habits, Fazio’s hypothesis states that attitudes based on direct experience are stronger (more easily retrievable or accessible) and more predictive of behaviour than attitudes which are not. Building on this, spreading activation theory has been used (particularly in marketing research) to hypothesise that when experience causes an attitude to become more salient, other attitudes and beliefs that are associated with the *catalyst attitude* are also brought to the fore through an unconscious process of ‘spreading activation’. This may then provide the platform for further behaviour change based on an underlying attitude.

The psychological models and mechanism outlined above provide some theoretical food for thought about the process of catalyst behaviours, although the evidence does not provide an answer to which theory or combination of theories provides the best explanation.

However, both the literature and our interviewees were somewhat clearer on one part of the catalyst behaviour picture: in the absence of some sort of *enabling conditions* at the individual level, the catalyst process is unlikely to occur. Different theories provide different interpretations of what these enabling conditions may be and this was mirrored in the practitioner evidence. For example, the theory of normative decision making emphasises awareness of the consequences of the moral issue at hand, which may develop partly through information and education. Some practitioners talked about things like values and knowledge as important enabling factors of spillover.

There are a number of ideas that seem to underlie most of the evidence on behavioural spillover. The next section outlines the most important.

2.6.3. Internal enabling conditions – values, beliefs, norms

According to Stern (2000), different behaviours are predicted by different combinations of norms, values and beliefs. A high association is often found between pro-environmental behaviours and a value set that includes an awareness of the ‘big picture’ - variously called universalism (Dietz et al, 2005; Thøgersen, 2003); self transcendent values (Stern, 2003); and altruism (Schwartz, 1977; Dietz et al, 2005). In a similar vein, Stern (2000) points out the importance of ‘world view’ for our behavioural choices and argues that personal moral norms are the main basis for individuals’ ‘general predisposition’ to behave in an environmentally friendly way.

The importance given in the literature to these internal individual influences on behaviour was mirrored in the practitioner literature and interviews. Practitioners emphasised that hypothesised catalyst processes do not occur in a vacuum but can be enabled or blocked by a wide range of influencing factors, including the beliefs, norms and values at both the individual and the community levels. It is impossible to ignore these factors in any discussion of behaviour change and they are equally relevant for understanding the catalyst behaviour change process.

Values-beliefs-norms theory (VBN) – Stern et al, 1999

Across the behaviour change literature in general, there is broad consensus that values are very important in behavioural choices. At the simplest level, if values are linked to decision making and behaviour, a change in values will result in a change in decision making and behaviour (Dietz et al, 2005). Linking this to the idea of catalyst behaviours, our question could therefore be reinterpreted as, ‘can performing an action lead to a change in values?’

Some support in favour of this suggestion is provided by Dickinson and Oxoby (2007), who argue that an individual’s ‘macro-disposition’ is the product of micro-beliefs from individual situations – that is, our overall configuration of norms, values and beliefs is a result of our actual experience. Sparks and Shepherd (1992) also find that self identity, which is closely linked to personal values (Holland et al, 2003; Dietz et al, 2005), is well predicted (although not completely) by past behaviour. This suggests that encouraging individuals to perform specific behaviours could have an effect on that individual’s configuration of values, norms and beliefs.

Stern’s (et al, 1999; Stern, 2000) values-beliefs-norms model postulates that values determine norms and beliefs, which go on to determine behaviour. According to this model, our situation specific beliefs comprise our awareness of consequences and our perceived ability to succeed in a behaviour. The discussion of psychological mechanisms above suggests that performing an action can influence both of these types of belief (awareness of consequences and perceived ability to succeed). This suggests that the values-beliefs-norms theory could work in reverse – that performing a behaviour could affect one’s norms and beliefs, which in turn could affect one’s values. In other words, the causation postulated from *values* to *norms and beliefs* to *behaviours* may flow in both directions – as well as values determining behaviours, behaviours may also determine values. This suggests that encouraging action could cause a change in values, which may in turn lead to further changes in behaviour in accordance with the changed values.

The values modes segmentation model (see Rose, 2009) provides another framework for exploring the links between values, attitudes and behaviours. This model, which categorises people into 12 psychographic types, suggests that there are periods of transition between values modes during which individuals are particularly responsive to change and to new ‘big ideas’. Research based on this framework (e.g. Rose et al, 2007) has suggested that individuals making the transition from ‘immediate picture’ (thinking about immediate needs and taking cues from those external to them) to ‘bigger picture’ values (thinking about more distal needs, such as the needs of others or of future generations, and taking cues from an internal moral framework) are often particularly open to adopting new attitudes that reflect a greater sense of universalism. This suggests that individuals in moments of transition or change might be those for whom

participating in pro-environmental behaviours may lead to fundamental shifts in values, thereby creating a platform for further, volitional pro-environmental behaviour change.¹³

General attitudes and dispositions

Similarly, Bamberg (2003) argues that ‘general attitudes’ (i.e. non situation-specific cognitions) are instrumental for an individual in defining a situation and determining the personally salient consequences of the behavioural alternatives. Dickinson and Oxoby (2007) suggest that dispositional traits and attitudes may have wide ranging spillover effects in other areas of life – their particular example is that ‘dispositional’ pessimism may affect one’s expectations and outcomes in the labour market and in social relations with others. It may be possible that ‘dispositional’ (or deeply held) pessimism or fatalism regarding environmental issues has a similar negative effect on ability and willingness to act and that spillover mechanisms such as cognitive dissonance may help us to understand these.

Kaiser et al (forthcoming) treat behaviours as ‘attitudinal dispositions’ to explain how it is simply the costs of a behaviour that create the notorious attitude-behaviour gap. Verbal claims toward a behaviour and actual behaviour spring from a common ‘behavioural disposition’. It is the cost or difficulty of the behaviour that creates the gap, rather than a disconnect between behaviours and attitudes. This appeal to ‘general attitudes’ or a general disposition is reminiscent of the transtheoretical model (Velicer et al, 1998), whereby behaviour change is often dependent on particular conditions of ‘awareness’ and ‘readiness for change’.

There are many critiques of these models and theories that rely on generalised conceptualisations of attitudes, dispositions and so forth. These are outside the scope of the current discussion. However, it is enough for us to note that behaviour change at the individual level happens in the context of internal psychological conditions. Whatever the nature of those conditions (whether they should properly be described as attitudes, values, and so on), the catalyst process could be enabled or blocked by them.

2.7 Summary and discussion

The idea of catalyst behaviours is intuitive and appealing, especially to policy makers and practitioners in the fields of pro-environmental behaviour change, due to its apparent potential to create a ‘multiplier effect’ of pro-environmental behaviours. There is also some intellectual basis for the idea that performing certain behaviours may lead to the adoption of other behaviours. However, there is little direct evidence in support of the idea of catalyst behaviours as an interpretation of behaviour and behaviour change.

This could perhaps be due to the methodological difficulties in isolating and measuring the process and its outcomes. It is possible that catalyst behaviours do exist but, as a complex human behavioural phenomenon, are simply too difficult to theorise or model – after all, the lack of formal evidence has not stopped community based practitioners from using related ideas with reported success.

It is striking that despite the lack of strong or direct evidence, the ‘belief’ in catalyst behaviours persists among academics and practitioners alike. There exists ‘circumstantial’ evidence around the existence of catalyst behaviours and the literature offers various possible theoretical models that may explain the process. The hypothesised catalyst behaviours are recognised by most to be extremely difficult to measure,

¹³ See New Economics Foundation for Defra, ‘Moments of change’ as opportunities for influencing behaviour (Thompson et al)

mainly due to the difficulty in isolating the process within the ‘noise’ of real life. It is also therefore possible that methodological difficulties are the reason for the thin evidence base.

Below is a summary of the headline findings of the evidence review and a discussion of their relevance to our research questions.

Pro-environmental behaviours are often observed to co-occur and be inter-related

The theoretical and practitioner evidence bases suggest that the pro-environmental behaviours are not treated independently of each other but are often linked at the levels of values, motivations, common goals, consequences, ‘similarity’ and practical considerations to do with costs and difficulties. Berger (1997) sums this up as saying that behaviours are linked at the level of both issues and activities. Some of the most compelling evidence that demonstrates that behaviours are inter-related is evidence of negative spillover (e.g. Frey, 1994; Thøgersen, 1999).

However, correlation is not the same as causation. Co-occurrence does not necessarily indicate a direct relationship between the behaviours themselves, but could equally indicate that both (all) behaviours are outcomes of a common underlying cause.

The strongest relationships are observed between behaviours that are conceptually closely linked (subject to external constraints/costs/difficulty of the behaviours in question)

Behaviours that are most *similar* to each other (Thøgersen (1999) refers to behaviours that are “conceptually and semantically proximate”) seem to be most highly correlated. The strongest correlations are often observed between groups of behaviours that people think about and describe in the same way, for example, ‘waste’ behaviours or ‘energy’ behaviours. However, conceptual links are subjective and may be surprising or unexpected. For example, Barr (2005) finds a noticeable disconnect between the two ‘waste’ behaviour categories of *recycling* and *waste prevention* (for example, avoid excess packaging, reuse glass), indicating that these are perceived to be qualitatively different.

It is possible that co-occurrence is a result of spillover or transfer effects, but the evidence in support of this is thin, ambiguous and largely anecdotal

Correlation is not equal to causation, but may be a clue about the existence of a relationship between behaviours. However, much of the evidence does not move beyond observing correlations; there seem to be serious conceptual and methodological difficulties in isolating and measuring the hypothesised catalyst process. There is also evidence in the health literature that behaviours that appear to be causally linked (e.g. ‘gateway’ soft drug taking and subsequent hard drug abuse) are in fact caused by a common underlying variable, rather than one behaviour causing the other.

Spillover effects can occur at a number of levels, e.g. at the level of attitudes and beliefs. Spillover from a catalyst behaviour to other behaviours is one specific type of spillover.

The literature defines *spillover* very broadly as the ‘side effects’ or extra consequences of an event or change of state. At the level of individual behaviour, this may include the knock on effects of changes in attitudes or beliefs or of new information or knowledge. Changes in behaviour (such as the uptake of a new behaviour) may lead to more generalised behaviour change and it is this specific type of spillover that is encapsulated by

the idea of catalyst behaviours. Some of the mechanisms that may help explain how one behaviour leads on to others include changes in attitudes, beliefs or knowledge.

If ‘natural’ catalyst effects between behaviours do occur, it could be possible to recreate or encourage the process in order to optimise these effects, or create effects that would not have otherwise occurred

Another important defining factor of the idea of catalyst behaviours is that it goes above and beyond the spillover (or ‘behavioural evolution’) that might be expected to occur naturally due to the common attitudinal links between our different behaviours and behavioural categories. Catalyst based behaviour change, from a policy and practice point of view, is about understanding this process in order to optimise it and achieve results that would not naturally occur. This may be termed ‘strong’ catalyst effect, in contrast to a ‘weak’ catalyst effect that simply speeds up a behavioural sequence that was likely to occur anyway.

There is no clear evidence about the timescale required for catalyst based change

Consumer behaviours are often embedded and stable, and the most habitual behaviours are the most difficult to change (Thøgersen and Ölander, 2003). However, the evidence suggests that catalyst effects are subject to situation-, individual-, and behaviour-specific conditions and constraints. This in turn suggests that the timescale for change may differ according to different behaviours, different individuals and different contexts.

Most proposed theoretical explanations for spillover in general and catalyst behaviours in particular depend on perceived relationships between behaviours

Most of the evidence for spillover, including the potential explanatory mechanisms of how the process works, depends on the premise that the different behaviours are perceived to be related. For example, striving for behavioural consistency or wanting to ‘complete the set’ only makes sense in the context of behaviours that are related to each other. Thøgersen (1999) and Kaiser and Bryka (forthcoming) state that spillover depends, by definition, on structural relationships between the behaviours.

The idea of categories is used in psychology to explain how individuals conceptualise and understand the world around them by grouping together similar objects. This idea of *categorisation* will therefore be key in understanding the relationships between behaviours and how the process of spillover might work.

Catalyst effects are likely to be behaviour, situation and individual specific

Different pro-environmental behaviours are at different stages of the adoption curve at both the individual and society levels – for example, recycling is something that has achieved high levels of adoption, whereas the majority of people are yet to install microgeneration. Some (groups of) individuals are further along their individual level adoption curves than others and the trigger and outcome behaviours of the catalyst process are likely to be different for these different levels of existing attitudes and behaviours. This indicates that a targeted, segmented approach would be just as important for a catalyst behaviour approach as it is for any other behaviour change technique.

Which behaviours are most likely to function as catalyst behaviours?

There is no firm evidence about which type of behaviour is most likely to catalyse other behaviours – for example, whether one-off or frequent behaviours are the best candidates to set off behavioural chain reactions. The ‘foot in the door’ literature suggests that small, easy steps are the best place to start, whereas

the self perception literature indicates that a big step that is far removed from one's existing personal norms would have the biggest effect on one's self perception. At the community or social level, insights from the field of community based social marketing suggest that the most 'visible' behaviours are likely to have the greatest effect on the prevailing social norm, which is an important enabling condition for catalyst effects. It has been suggested that, whereas small steps may not necessarily lead on to bigger steps, big, socially visible behaviours are likely to lead to smaller ones: "Fitting an energy saving light bulb won't convince people to buy a wind turbine, but a wind turbine on their roof may encourage them to buy the bulb" (Futerra, 2006; see also WWF, 2008; 2009).

It is likely that all of these different types of behaviour may have a part to play, especially if catalyst based change is seen as one part of a wider behaviour change strategy, rather than a stand alone intervention type. However, further action based research would be needed to test the relative effects of different types of catalyst or trigger behaviours.

Catalyst effects may be suppressed by stronger (anti) motivational forces (which also vary from individual to individual but may include barriers such as monetary cost)

As with any behaviour change strategy, there may be certain conditions that have an effective veto on any attempt to encourage spillover. For example, if it is beyond the financial resources of a person to engage in either the trigger or outcome behaviours, spillover is unlikely to occur.

Catalyst effects may comprise both conscious/reasoned processes and unconscious/automatic processes

Most of the evidence around spillover and catalyst behaviours works on the assumption that the process is conscious, deliberative and accessible to the individual. However, many aspects of our behaviour, such as our habits, are not reasoned or deliberative. It would be unwise to exclude automatic behaviours from our enquiry into catalyst effects, since the evidence suggests that they may be an opportunity as well as a barrier to spillover.

Catalyst effects are likely to depend in some way on enabling conditions at the individual level of norms, values, beliefs and attitudes

The existing configuration of internal cognitive conditions has a strong impact (direct and indirect) on behaviour. It is therefore essential to factor these in to the equation of catalyst based change, not only because they provide the context in which change happens, but also because they may be directly involved in the mechanism of behaviour to behaviour spillover.

Summary remarks

It seems that, taken as part of a wider behaviour change context, a catalyst behaviour approach could perhaps dovetail with and enhance a number of different behaviour change tools. One of the key factors or common themes of any catalyst behaviour based intervention would be the fostering of linkages between different but related behaviours.

Before embarking on such a strategy, greater clarity is still required about the likely behaviours and processes involved. The next sections of this report focus on the relationships and links between pro-environmental behaviours, both at the level of how people conceptualise them (section 3 – pilot exercise) and the behaviours that co-occur or are performed consistently (section 4 – cluster analysis).

The next section sets out the findings of the pilot fieldwork exercise, designed to explore categorisation, 'sets' of behaviours and the types of 'similarity' that people perceive to exist between different pro-environmental behaviours.

3 Pilot exercise

The overarching aim of the pilot exercise was to explore the relationships and links that people perceive to exist between different pro-environmental behaviours. As a first step in understanding how one behaviour might catalyse (or block) the uptake of other behaviours, it is important to understand how and why people relate these behaviours to each other.

The classification systems people use to understand the world are a “central clue” to understanding behaviour (Canter et al, 1985). It is well established in psychological theory that, in order to avoid having to process every object, situation, issue and behaviour as new and unique, non identical stimuli are treated as exemplars of a particular category (Smith and Medin, 1981; Rosch, 1977). The link between an individual’s categories and how that individual behaves is summed up by Canter (1985):

“...the conceptual framework of constructs and the categories on which the respondent draws are...the starting point for understanding the respondent’s action in the world.”

The pilot exercise methodology was designed to examine *how* people categorise pro-environmental behaviours and, crucially, *why* they categorise them the way they do. An additional aim of the pilot exercise was to test the methodology (the multiple sorting procedure – see below) and gauge whether this approach is an effective means of generating evidence about pro-environmental behaviours in general and catalyst behaviours in particular.

3.1 Rationale behind the methodology

Our chosen method of deepening our understanding of how people perceive pro-environmental behaviours and the relationships between them was the multiple sorting procedure, a qualitative methodology rooted in psychological theory. The multiple sorting procedure requires participants to sort a set of elements (in this case pro-environmental behaviours) into different categories. This allows participants to generate their own classification systems for the behaviours, rather than constraining responses according to constructs¹⁴ prescribed by the researcher.

The choice of methodology was closely tied to the literature on behavioural spillover. Implicit in the definition of spillover and catalysts are the existence of relationships between behaviours. Investigating how behaviours are perceived to relate to each other, and why, may help us to build up a picture of where spillover might occur and how it might work. It may also help us to establish where the boundaries between different behaviour types are, and how these categories relate to each other. This is important because the majority of mechanisms that emerge from the literature as possible explanations for catalyst behaviours are based on an assumption of perceived similarity of the target behaviours, from psychological theories such as

¹⁴ The word *construct* is used in psychology to describe the concepts, ideas and language that people use to mentally construct the world. Kelly (1955) states: “Man looks at his world through transparent templates which he creates and then attempts to fit over the realities of which the world is composed. (pp.8-9) Constructs are used for predictions of things to come, and the world keeps on rolling on and revealing these predictions to be either correct or misleading. This fact provides the basis for the revision of constructs and, eventually, of whole construct systems. (p.14)”

cognitive dissonance (for example, one cannot perceive oneself to be behaving inconsistently across unrelated behaviours) to marketing insights regarding complementarity and product ‘fit.’

In order to investigate the possibility of spillover across boundaries from one behaviour/behaviour type to another behaviour/behaviour type, an important starting point is understanding where these boundaries lie for different people.

Various other considerations informed our methodology design. As Thøgersen and Ölander (2003) suggest, consumer behaviours tend to be part of stable and embedded patterns, so if spillover does occur, a relatively long time period may be required to observe the entire process. Therefore, rather than attempting to investigate the entire lifecycle of the hypothesised catalyst process (which would ideally require longitudinal research) we decided to focus on one of the fundamental premises of the idea.

Another reason for choosing the multiple sorting procedure was that the majority of existing studies that set out to investigate spillover are based on statistical analysis of survey data (e.g. Thøgersen, 1999; 2004; Thøgersen and Ölander, 2003; Byrka et al, 2009). There is a lack of systematic qualitative research and therefore little is known about the ‘contextual noise’ that the evidence review indicates is so crucial for understanding catalyst based behaviour change. Additionally, survey designs can impose constraints on the way in which respondents answer and may be biased in favour of the researcher’s own conceptualisations of the subject matter, whereas our focus is specifically participants’ own, non-expert conceptualisations of pro-environmental behaviours.

Bearing in mind all these considerations, the pilot exercise was designed around the qualitative multiple sorting procedure and multidimensional scalogram analysis. Full explanations of these research techniques may be found in sections 3.3 – 3.5.

3.2 Recruitment

For the purposes of this small scale pilot exercise, a street sample of 18 participants was recruited in West London. The sample covered a range of different types of people – it included equal numbers of men and women and also covered a range of age groups, ethnicities and socio-economic groups. Table 1 gives an overview of some of the background characteristics of the pilot sample¹⁵.

¹⁵ Note that the sample size is too small to allow us to make inferences about the effects of these background characteristics on participants’ judgements.

Table 1 Background characteristics of pilot sample			
Criteria		Total	
Gender	Male	9	50%
	Female	9	50%
Age	18-25	3	17%
	26-35	4	22%
	36-45	4	22%
	16-55	2	11%
	56-65	3	17%
	65+	2	11%
Socio-economic group	ABC1	10	56%
	C2DE	8	44%

Two short questionnaires were used to gauge participants' existing levels of pro-environmental behaviours and attitudes; one recruitment questionnaire containing five 'lifestyle' questions and a follow-up questionnaire containing two questions specifically about pro-environmental attitudes and behaviours (see appendix 4 for the questionnaire and results). The recruitment questionnaire did not contain overtly environmental questions in order to avoid priming participants' environmental values before the interview started.

Recruiting the entire sample from west London means that participants were clearly not representative of the wider population, and the sample size is too small to draw firm conclusions about the importance of background characteristics such as age or socio-economic group. However, the aim of the pilot exercise was to explore the value of this methodology in the context of pro-environmental catalyst behaviours and to investigate its potential for larger scale research or as a component in such research. In addition, the multiple sorting procedure and multidimensional scalogram analysis are tolerant of small sample sizes – around 8-10 people are sufficient for the tool to reveal underlying patterns in the categories and concepts people use to understand a given subject.

3.3 The multiple sorting procedure

The multiple sorting procedure is a qualitative interview technique for eliciting the views and judgements of participants. One advantage of the method is that the interview is not conducted in the format of a question and answer session, but is more 'participant led', thereby reducing the possibility of results being skewed or biased by the researcher's own views. A second important advantage is that the method generates results that can be structured and systematically analysed using statistical techniques. The interpretation of the results relies equally on the structured statistical analysis and the qualitative interview data.

The sorting exercise was conducted during a face to face interview with each individual. Participants were first asked to spend a few minutes familiarising themselves with a pack of 25 cards, each with a behaviour written on it (see table 3). The first stage of the interview involved *free sorts* – that is, participants were invited to sort the cards into categories of their own choosing, based on whatever criteria they wished. Participants were instructed that each group should contain behaviours that were similar to each other *in some important way* - the basis of this similarity judgement was left up to them. Participants could sort the cards into as many groups as they chose and each group could have as many cards in it as they liked.

Participants were assured at the beginning of each sort that there were no right or wrong answers, but it was their views that counted.

Participants were encouraged to say anything that occurred to them as they performed the task and after each sort, they were asked about *why* they categorised the elements in that particular way. Interviews were recorded and researchers made a note of the groups identified and the explanations, comments and thoughts offered by participants. This was a crucial part of the process, since these insights are essential for interpreting the outputs of the multidimensional scalogram analysis (see section 3.5). At this stage, prompting and probing by researchers was kept to a minimum in order to elicit the most salient, top of mind reactions and to avoid leading or steering participants' judgements.

After participants had conducted as many free sorts as they felt able to complete, they were invited to complete a series of *semi-structured* and *structured* sorts. For semi-structured sorts, participants were provided with the theme of the sort in the form of a specific question – for example, 'Why do you think people don't do some of these actions?' – and were invited to sort the cards into categories in answer to that question. Again, the number of categories and structure of each category was chosen by the participant. Structured sorts involved the researcher specifying the theme of the sort – a specific question such as 'Which of these do you do and not do' – as well as the categories into which the cards should be sorted – for example, things you do 'always', 'sometimes' and 'never'. Table 2 below summarises the programme of free, semi-structured and structured sorts conducted with each individual.

Table 2 Sort programme for the multiple sorting procedure

Type of sort	Theme	Categories
Free sorts (as many as participant wishes to do)		
Semi structured	What are the reasons that people don't do these things?	Participant chooses the 'groups' into which items are sorted and offers their own description of why they categorised items under different reasons
Structured	Which of these do you do and not do?	Participants are asked to sort items into: Always Sometimes Never
Semi structured	Why do you do and not do these (i.e. sort the groups from previous sort)?	
Structured	Considering the things you do, in what order did you start doing them?	Earlier Later
Structured	How much would it help the environment if everyone did these things?	A huge amount A bit Not much at all

The objective of this programme of *free*, *semi structured* and *structured* sorts was to build up the richest possible picture of the categories and constructs participants used and how these may relate to the question of catalyst behaviours. The semi-structured and structured sorts were designed so that the data generated could be combined or overlaid with the free sort data to help us gain some insight into some of our research

questions; for example, by asking people to sort the behaviours into actions they do always, sometimes and never, we could compare this data to their free categorisations to see whether, and how, these related to each other.

Table 3 below contains the 25 behaviours used in the sorting task. This set of behaviours was drawn from across the lifecycle of consumer behaviour (for example, they include purchasing behaviours and home behaviours) and include behaviours from different domains (for example, food, waste, travel, energy). The behaviours were selected from a variety of sources from the literature, including Defra's headline and wider set of behaviours, as well as the behaviours studied in the literature on pro-environmental behavioural spillover (particularly Thøgersen and Ölander, 2006 and Byrka and Kaiser, forthcoming). The final set was selected (in consultation with Defra) to cover a range of behaviours that the research team conceptualised as difficult and easy; every-day and one off; habitual and deliberative; visible and invisible; and behaviours with a large impact and a smaller impact.

Table 3 General pro-environmental behaviours used in the sorting exercise	
General behaviours	
1. Walk or cycle for short journeys	14. Have insulation installed
2. Buy organic vegetables	15. Have solar panels installed
3. Eat fruit and vegetables that are in season in the country where they are grown	16. Switch to a green energy company or tariff
4. Recycle (e.g. plastic bottles, paper etc)	17. Buy energy efficient white goods (e.g. fridges, washing machines)
5. Waste less food	18. Donate old clothes to charity
6. Switch TV and mobile phone charger off at the plug	19. Compost food or garden waste at home in a compost bin/heap
7. Wash clothes at 30 degrees	20. Grow fruit and vegetables
8. Repair old or damaged clothes	21. Shop in local shops or markets rather than the supermarket
9. Buy eco-friendly cleaning and laundry products	22. Buy sustainable wood products (such as FSC certified timber)
10. Turn off the tap while cleaning teeth	23. Buy sustainable fish products (such as MSC certified fish)
11. Avoid using single use carrier bags	24. Volunteer in environmental conservation and /or wildlife projects
12. Buy fair trade products	25. Buy plants and create habitats that encourage wildlife in the garden
13. Use energy efficient light bulbs	

3.4 Content analysis

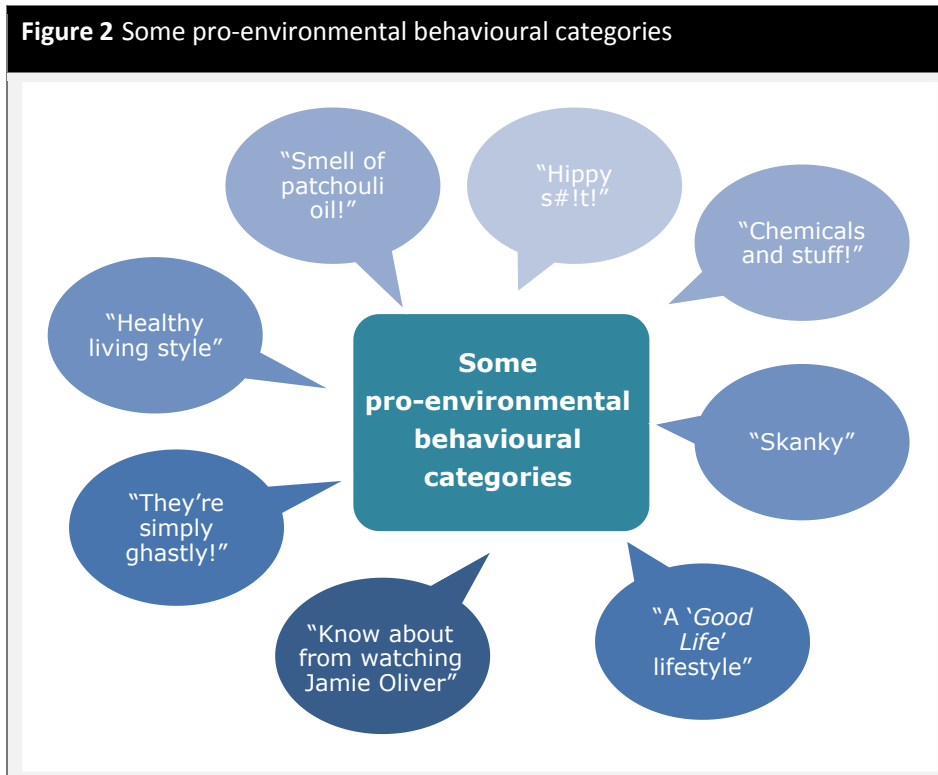
Between them, the 18 participants conducted 45 free sorts, giving rise to 152 ways of categorising the behaviours. The average number of free sorts per person was 3 and the average number of categories per free sort was 4.

In order to develop a typology of the constructs (category descriptions)¹⁶ generated by participants, the sort data were independently content analysed by two analysts. One of the project researchers who was familiar with the interview data conducted the first analysis, the aim of which was to group the concepts people used into types. For example, if one participant included a category called “Expensive” and another included a category called “Money”, these could be brought together under an umbrella term such as “Cost”. This enabled us to gain an overview of the types of concepts that were used most during the sorts. The second analyst, who had not been involved in the interviews, was given the master list of concept types and asked to classify the data according to this list¹⁷. Any disagreements between the two analysts were discussed until agreement was reached (see Wilson and Mackenzie, 2000 and Coghlan, 2006 for further discussion of content analysis). The table below shows the types of constructs generated during the free sorts.

Table 4 Constructs generated in free sorts	
Constructs	Frequency
Things I do and don't do	47
Environment	16
Doesn't fit/odd one out	15
Waste	11
Energy	10
Lifestyle	10
Purchasing	9
Cost	4
Food	4
Location (i.e. where I do this)	4
Altruism	3
People	3
Health	3
Personal infrastructure	3
Resources	2
Clothes	2
Not sure it makes a difference	2
Good for the economy	1

¹⁷ Inter-rater reliability = 0.81. Calculated using the joint-probability of agreement, which the literature suggests is a simple and acceptable method for nominal data (e.g. Wilson and Mackenzie, 2000).

Table 4 provides an overview of the types of concepts employed by participants. However, the simplified, standardised nature of this table means that the richness of participants' descriptions is lost. It was striking that each participant used a unique vocabulary to describe their categories and many constructs that emerged were highly personal and quite different from how experts and policy makers might categorise the behaviours. Figure 2 below provides some examples of the category descriptions generated by participants.



3.5 Multidimensional scalogram analysis

Data generated during the interviews was analysed using multidimensional scalogram analysis (Lingoes, 1968). The combination of the multiple sorting procedure and multidimensional scalogram analysis provides a means of structuring qualitative interview data and analysing and depicting it systematically using statistical techniques. In contrast to other statistical methods, however, this combination of techniques retains the rich, qualitative data that is crucial for understanding attitudes and behaviours.

As participants performed each sort, the interviewer recorded the number of categories identified, the description of each category and the cards each category contained. This data was translated into a table with the behaviours as rows and the people as columns. The numbers entered into the cells of the table represented the category into which each behaviour was placed by each individual:

	Person 1	Person 2	Person 3
Walk or cycle	1	1	1
Buy organic vegetables	1	2	2
Recycle	2	3	2
Install solar panels	2	4	2

This hypothetical example shows that Person 1 placed 'Walk and cycle' and 'Buy organic vegetables' together in one category and 'Recycle' and 'Install solar panels' in a second category. Person 2 placed each behaviour in a different category; and Person 3 placed 'Walk or cycle' in a separate category to the other three behaviours. It is important to note that each person's categories are unique: person 1's category 1 may be 'Chemicals and stuff' while Person 2's category 1 may be 'Transport' – the matrix tells us which behaviours were put together, but not *why*.

Comparison of the rows and columns shows which behaviours were categorised as similar most and least frequently – for example, we can see above that 'Recycle' and 'Install solar panels' were put together in the same category by two out of the three people. In contrast, 'Walk or cycle' and 'Install solar panels' were never put in the same category. By referring to the category descriptions used by participants and their reasons for their classifications, we can begin to build up a picture of *why* behaviours were classified as similar or dissimilar.

Multidimensional scalogram analysis was used to produce a visual representation of these matrices in the form of scatter plots (see section 3.6). In the plots, each behaviour is represented as a point in geometric space. The distance between points represents how often behaviours were classified as similar: the closer the points are on the plot, the more similar they were judged to be by participants; and the further away they are, the more dissimilar they were viewed to be.

Multidimensional scalogram analysis is a non metric scaling technique, with the plot representing the universe of attributes assigned to the behaviours – the axes are not numeric and the relationship of points to axes is not meaningful. In order to interpret the plot, it is necessary to return to the qualitative data collected during the interviews: it is this that provides insight into *why* behaviours were classified as similar or different. The next section provides further explanation of the interpretation of multidimensional scalogram plots.

3.6 Results

3.6.1. Free sorts

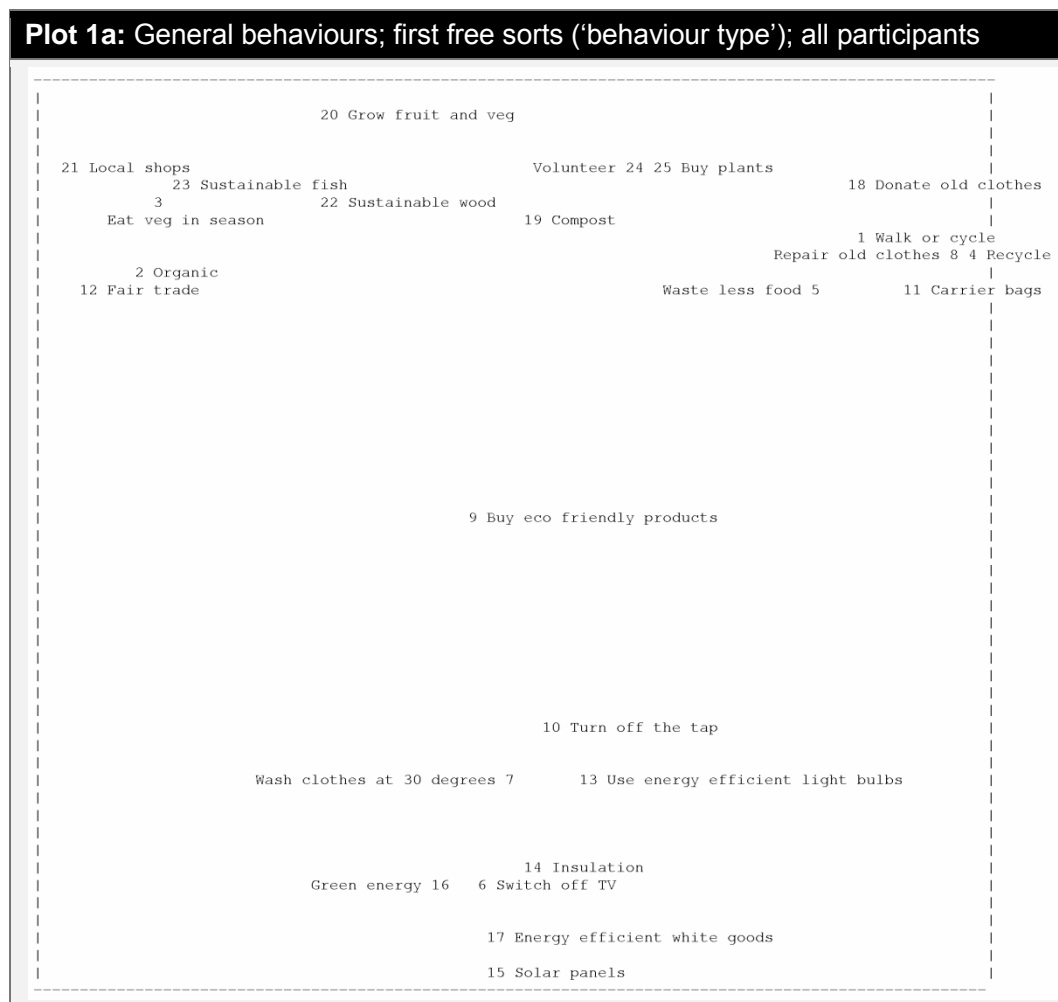
Each participant was first invited to perform a *free sort*, whereby they were free to choose the theme or basis of the sort and the categories to be used. Participants performed as many free sorts as they wanted or were able; the minimum number performed by a participant was one, the maximum was four.

Half of participants conducted their first free sort on the basis of 'things I do and don't do'. Out of a total of 45 free sorts, 16 were conducted on this basis. The remaining sorts were performed on the basis of 'behaviour type' – that is, the connections (or family resemblances) between the behaviours themselves, rather than the relationship of the participant to the behaviours (which was the case in the 'things I do' sorts). All participants did at least one 'behaviour type' free sort.

All free sorts were first analysed together. However, in line with the aims of this pilot study – to explore perceived relationships between the behaviours - the 'behaviour type' free sorts were separated from the 'Things I do and don't do' free sorts.

The analysis gives a separate plot showing the results for each participant, as well as an amalgamated ‘top plot’ containing the solution for all participants. Plot 1a below shows the top plot of the participants’ first ‘behaviour type’ free sorts¹⁸. Only the first free sorts are shown since these represent the most top of mind, salient constructs used by participants. An analysis was also run with *all* ‘behaviour type’ free sorts; the distribution was not noticeably different.

It is worth remembering at this point that the small sample size precludes generalisation; however, the following gives some idea of the way in which our participants thought about the behaviours included in the set.



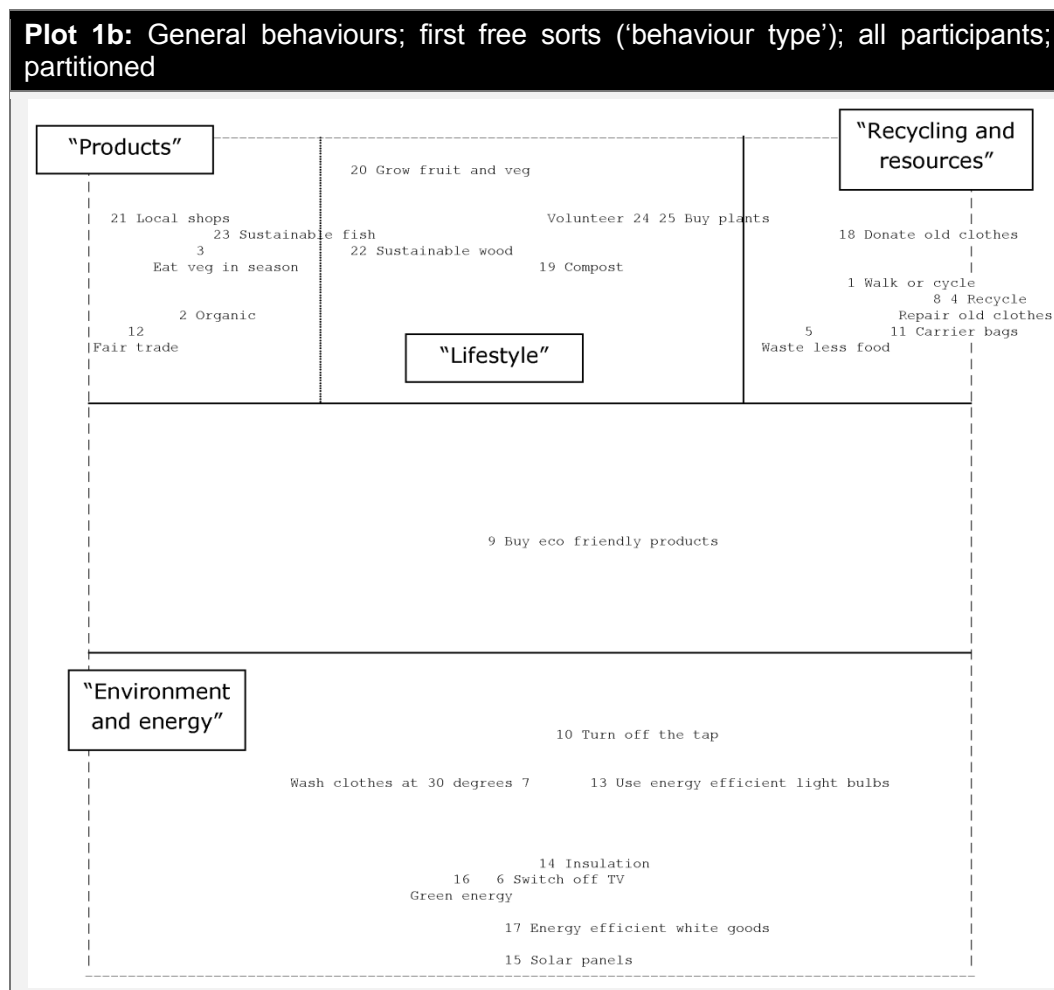
As outlined above, the closer points are to each other on the plot, the more ‘similar’ they were perceived to be by participants. The distribution of points on Plot 1a suggests that some distinctive groups of behaviours did emerge from participants’ ‘behaviour type’ free sorts. Reference to the interview data and the explanations given by participants for their categorisations allowed us to identify the dominant constructs

¹⁸ The following convention will be used to denote the theme/basis of a sort and the categories generated under that theme:

‘Theme’ e.g. ‘Behaviour type’
“Category” e.g. “Food”

Note that the labels on the plots below are abbreviated versions of the behaviours listed in table 3 of this report.

responsible for this distribution of points; in other words, *why* did participants categorise those particular behaviours together? Plot 1b shows the same plot of 'behaviour type' free sorts partitioned according to the constructs used by participants.



The qualitative interview data suggest that participants generally considered energy behaviours to be 'environmental' behaviours, in contrast to the cluster of waste and recycling behaviours that is located at the opposite side of the plot and was not identified specifically as "environmental." There also appears to be some movement across the top section of the plot from purchasing behaviours on the left to re-use and waste behaviours on the right, suggesting perhaps that participants distinguished between the buying and consumption of products and the end-of-life of those products. Overall, the main observation to be made about the distribution of points on this plot is that the most coherent cluster seems to comprise the energy-related 'environmental' behaviours, whereas the other, non-energy behaviours fall into less clearly delineated regions of the top part of the plot.

Aside from the overall distribution of points, one or two behaviours on this plot are worth mentioning in their own right. For example, the location of 'Walk or cycle for short journeys' amidst the "recycling and resources" behaviours is notable. The interview data suggest that participants perceived 'walk or cycle' to be related to the "recycling and resources" behaviours due to the view that using the car for short journeys is unnecessarily wasteful. It is also interesting to note the central location of 'Buy eco friendly cleaning and

these sometimes and feel guilty when I don't"; "I do these sometimes but don't feel guilty if I don't"; and "I positively don't do these and I don't feel guilty about them." It is worth noting that both 'green' and 'non-green' participants (see section 3.6.3) performed 'things I do' sorts, so the relative size and structure of categories was also highly variable for this reason (see plots 3a and 3b in section 3.6.3 below for a comparison of the 'green' and 'non-green' participants' 'behaviour' type free sorts).

It is interesting to note the similarities and differences between the free sorts performed on the basis of 'behaviour type' and those on the basis of 'things I do'. In terms of overall differences, for example, the 'things I do' plot is less structured and has a more diffuse distribution of points than the 'behaviour type' plot, indicating lower levels of consensus during the 'things I do' sorts. It is also noticeable that the energy behaviours that so clearly cluster together in the 'behaviour type' plot are more widely distributed in the 'things I do' plot.

In terms of similarities, the "recycling and resources" category on the 'behaviour types' plot roughly corresponds to the "things I always do" category on the 'things I do' plot. This is perhaps unsurprising, given the popularity and prevalence of waste behaviours such as recycling. However, there are some interesting differences (in *italics*) in the structures of these roughly corresponding categories:

Table 5 Category structure: "Recycling and resources" and "Things I always do"	
'Behaviour type' ("Recycling and resources")	'Things I do' ("Things I always do")
Donate old clothes to charity	Donate old clothes to charity
Walk or cycle for short journeys	Walk or cycle for short journeys
Recycle (e.g. plastic bottles, paper etc)	Recycle (e.g. plastic bottles, paper etc)
Avoid using single use carrier bags	Avoid using single use carrier bags
Waste less food	Waste less food
<i>Repair old or damaged clothes</i>	<i>Switch TV/ phone charger off at the plug</i>
	<i>Use energy efficient light bulbs</i>
	<i>Turn off the tap while cleaning teeth</i>

There seems to be a core set of elements that are common to both categories, but the "things I always do" cluster contains some boundary spanning energy-related elements that are found separately on the 'behaviour type' plot. This may indicate that 'behaviour type' is not playing a dominant role in the distribution of behaviours on the 'things I do' plot; or at least that the influence of behaviour type is suppressed by 'things I do.'

This raises questions about the links between what people do (the 'things I do' plot) and how people categorise 'behaviour type'. At first glance, although there are some similarities between the two plots, the distribution of behaviours and structures of the clusters in each are quite different. In other words, 'things I do' does not seem to influence 'behaviour type' categorisations, and vice versa.

In order to explore further the possible connections between behaviour patterns and 'behaviour type' categorisations, we used data from structured sort 1 – 'Which of these do you do always, sometimes, or

never’ to calculate how often each behaviour was put into the always, sometimes or never category by all participants. This gave us a very rough ranking of the most frequently performed behaviours to the least frequently performed behaviours across the whole sample. Table 6 contains the behaviours in the set ranked based on the weightings of how frequently they were put into the “always”, “sometimes” and “never” categories.

Table 6 Ranking of behaviours from structured sort 1 (Which do you do always, sometimes, never?)

Behaviour	Always	Sometimes	Never
1. Recycle (e.g. plastic bottles, paper etc)	13	3	2
2. Walk or cycle for short journeys	10	8	0
3. Avoid using single use carrier bags	10	7	1
4. Use energy efficient light bulbs	10	7	1
5. Donate old clothes to charity	10	6	2
6. Waste less food	8	10	0
7. Switch TV and mobile phone charger off at the plug	11	3	4
8. Turn off the tap while cleaning teeth	10	5	3
9. Eat fruit and vegetables that are in season in the country where they are grown	6	10	2
10. Shop in local shops or markets rather than the supermarket	3	14	1
11. Buy energy efficient white goods (e.g. fridges, washing machines)	7	4	7
12. Wash clothes at 30 degrees	6	5	7
13. Buy fair trade products	2	13	3
14. Buy organic vegetables	1	15	2
15. Buy plants and create habitats that encourage wildlife in the garden	7	1	10
16. Repair old or damaged clothes	4	7	7
17. Buy sustainable fish products (such as MSC certified fish)	2	8	8
18. Grow fruit and vegetables	4	3	11
19. Compost food or garden waste at home in a compost bin/heap	4	1	13
20. Buy eco-friendly cleaning and laundry products	0	9	9
21. Have insulation installed	3	2	13
22. Volunteer in environmental conservation and /or wildlife projects	2	2	14
23. Switch to a green energy company or tariff	2	1	15
24. Buy sustainable wood products (such as FSC certified timber)	1	3	14
25. Have solar panels installed	1	1	16

When this ranking was mapped onto 'behaviour types', again there was no discernible pattern relating the 'behaviour types' plot distribution to the 'popularity' of the behaviours. For example, the mapping shows

that in the waste and resources cluster, the most popular behaviour (recycling) is closest to the fifteenth most popular behaviour (repair old or damaged clothes). Similarly, in the “energy and environment” cluster, the fourth most popular behaviour (use energy efficient light bulbs) appears next to the least popular of all (install solar panels).

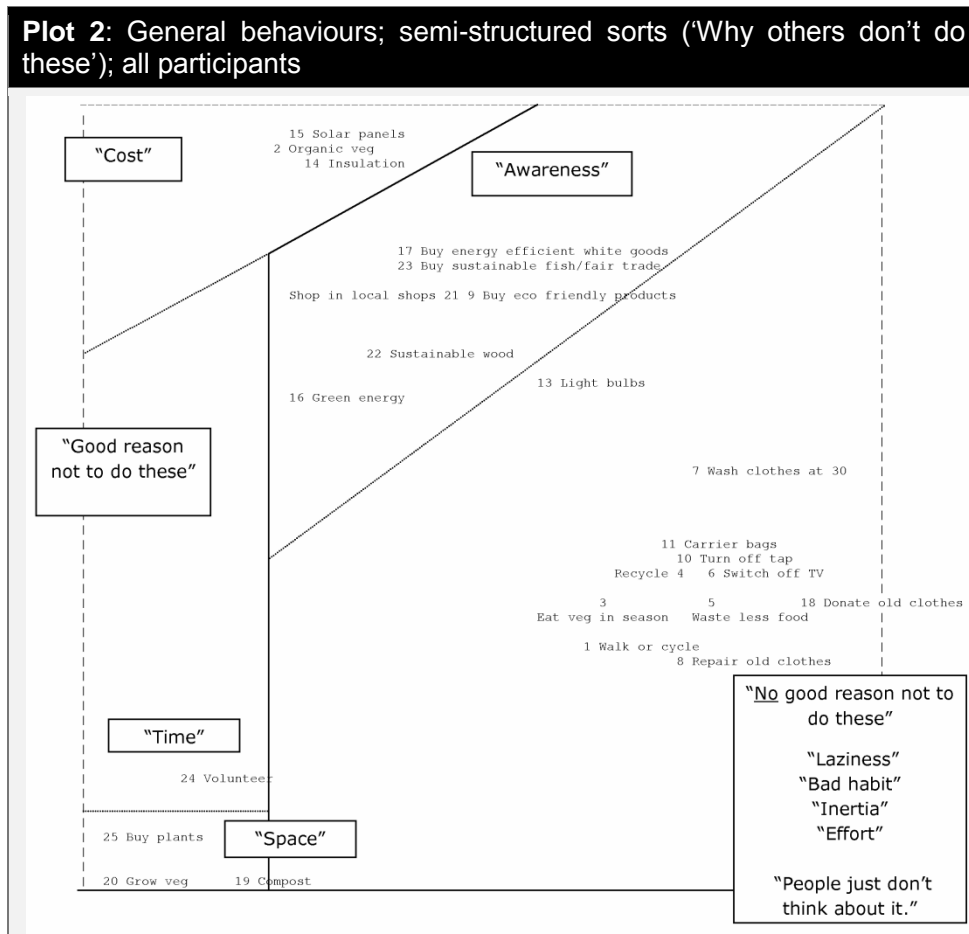
Assuming that people strive for consistency in their behaviour (Festinger, 1957; Dickinson and Oxoby, 2007; Mullen and Nadler, 2008; Thøgersen, 2004), we might expect ‘behaviour type’ categorisations to match behaviour patterns more closely. There are several possible interpretations of the apparent disconnect between the two. For example, following Kaiser and colleagues, we could argue that it is simply the cost or difficulty of a behaviour, as perceived by the individual, that prevents it co-occurring with others of its ‘type’. For example it seems that the easy energy behaviours, such as ‘Use energy efficient light bulbs’ and ‘Switch TV and charger off at the plug’ have stayed together on the ‘things I do plot’, whereas the more difficult behaviours such as ‘Install solar panels’ have been grouped separately with other more difficult behaviours. This suggests the possibility that ‘behaviour type’ categorisations could be suppressed in actual behaviour patterns by the perceived cost or difficulty of the behaviours.

From a slightly different (although related) perspective, it may also be possible to explain the apparent disconnect between ‘behaviour type’ and ‘things I do’ through the theory of cognitive dissonance. This tells us that, where an extrinsic reason for not performing a behaviour exists (for example, its cost or one’s lack of skill), cognitive dissonance brought on by perceived inconsistency is neutralised since the inconsistency is perceived to be out of the person’s control. For example, the waste cluster on the ‘behaviour type’ plot contains ‘Repair old or damaged clothes’. This behaviour, which relies on a specific skill that many participants claimed not to have, becomes separated from the other (easy) waste behaviours on the ‘things I do’ plot.

Also from a cognitive dissonance perspective, we could speculate that ‘behaviour type’ does not provide a basis for perceived consistency or inconsistency and this is why people apparently do not behave consistently according to their ‘behaviour type categories.’ In this case, we could also speculate an alternative basis for consistency, for example a common goal underlying the different behaviours (see e.g. Kaiser and Wilson, 2004). Whatever the reason, however, it appears that the ‘behaviour type’ categorisation does not necessarily interact with or inform behaviour in the real world.

3.6.2. Semi-structured sorts

In order to build up a detailed, multidimensional understanding of the reasons *why* people perceived particular relationships between the different behaviours, participants were also asked to perform two semi-structured sorts – that is, they were provided with the basis of the sort but were still free to choose the number of categories to sort the cards into and the content and description of those categories. As the basis for the first of the semi-structured sorts, participants were invited to think about *other people* (not themselves) and the reasons why others might *not* do the behaviours on the cards. The categories – that is, the reasons why people might not perform these actions – are shown on plot 2.



On average, participants each identified six reason types for why other people might not do the 25 behaviours on the cards. There seems to be movement across this plot from "good reasons" not to do to the behaviours on the left, comprising things like cost and lack of a garden, to "no good reason" not to do them on the right. The largest cluster of reasons attributed to 'other people' for not participating in these behaviours consists of reasons like "laziness", "inertia" and "people just don't think about it."

"It's just plain idleness."
(Male, 65+, C2DE)

"People don't think when they're shopping. They just do the quickest thing."
(Female, 26-35, C2DE)

The behaviours in the region entitled "awareness" are closer to the "good reason for not doing them" side of the plot and this was reflected in the reasons given by some participants for their groupings:

"I don't know enough. I just go for the cheapest."
(Male, 56-64, ABC1)

One reason for doing this semi-structured sort was to gain some insight into why people might not do behaviours – asking participants about *other people* provides a more socially acceptable way of doing this. As

the last quote suggests, even when invited to think about other people, participants used themselves as a reference point.

When explicitly asked to think about *themselves* and the reasons why they do and do not do the behaviours in the set, participants took a slightly different approach. It was striking that the average number of categories when people thought about themselves was much higher than when they thought about other people. One person identified 16 reasons to explain why he does and does not do the 25 behaviours and the average was 10 reasons. Although the scope of this question was broader (they were asked to think about why they *do and don't do* the behaviours), participants certainly gave much more detailed reasons for their own behaviour compared to when they thought about other people.

"I did it to save money and because of the thought of fire and not wasting electricity."
[Switch TV and mobile phone charger off at the plug].
(Female, 46-55, ABC1)

"I'm aware of this but we buy our fish from a man in a van. It feels awkward to be asking him about where it comes from."
[Buy sustainable fish products]
(Female, 35-46, ABC1)

In accordance with attribution theory (Heider, 1958), it was apparent that people often (although not always) gave external reasons for why they did not perform certain actions – such as “I have a back condition. I couldn’t do that” - whereas they tended to attribute dispositional traits such as “laziness” to others.

The “no good reason not to do this” cluster in plot 2 contains many of the easiest or lowest cost behaviours and this cluster is very similar to the group of behaviours that participants stated they ‘always’ did during their free sorts. The clustering of behaviours of similar difficulty or cost on these plots indicates that perceived cost was dominant in participants’ categories within the ‘action based’ themes of what they and other people do and do not do, and why (see Kaiser and Wilson, 2004; Kaiser et al, 2008, Bryka, Kaiser and Hubner, forthcoming).

3.6.3. Greens and non-greens

In line with the aims of this research, we also decided to explore whether different types of people – namely, ‘green’ and ‘non-green’ people - categorised the behaviours differently. In order to identify these two separate groups within our pilot sample, we used a combined variable of two questionnaire scores that were chosen as being most diagnostic of pro-environmental behaviours and attitudes. We combined participants’ scores from the following questions from the recruitment and follow-up questionnaires.

- How often do you choose the most environmentally friendly products when shopping?
 - always;
 - most of the time;
 - occasionally;
 - never.
- Which of these would you say best describes your current lifestyle?

- I don't really do anything that is environmentally friendly;
- I do one or two things that are environmentally friendly;
- I do quite a few things that are environmentally friendly;
- I'm environmentally friendly in most things I do;
- I'm environmentally friendly in everything I do;
- Don't know.

We took the top and bottom terciles²¹ to represent 'greens' and 'non-greens' respectively and excluded the middle third²². As an additional check on the validity of the green/non-green measure, we also calculated the average size of each group's categories of behaviours they reported doing 'always', 'sometimes', or 'never'. Table 7 shows, as expected, clear differences in the average number of actions that the greens and non-greens respectively reported doing 'always' and 'never.'

Table 7 Average category size for green and non-green participants: Structured sort 1: which behaviours do you do always, sometimes and never?			
	Always	Sometimes	Never
All	7.61	8.22	9.28
Greens	10.83	8.50	5.67
Non greens	3.67	7.33	14.00

There were also some differences in the background characteristics of the two groups (see table 1 for the characteristics of the whole sample)²³. The green group was made up of equal numbers of men and women, all of whom were in the 36-45 age group or above. This group also contained equal numbers of people from the ABC1 and C2DE socio-economic groups. The non-green group was dominated by younger males: it contained five men and only one woman, and over half were in the two youngest age groups (18-35). None belonged to the oldest two age groups. This group contained 4 ABC1s and 2 C2DEs.

Overleaf are the results of the greens' and non-greens' 'behaviour type' sorts.

A note on outliers

Initial analysis of the non-green group's sorts indicated that one behaviour had been categorised very differently by most participants. 'Walk or cycle for short journeys' was perceived to be so different to the others by this group that its disproportionate distance from the other behaviours caused the plot to be skewed and all the other points to be squeezed into one small area. In order to interpret the other behaviours and see the patterns in the main group, it was necessary to remove the outlier and re-analyse the distribution (see Lingo, 1977 for justification and more details).

The fact that this behaviour was considered to be quite different to the rest by the non-greens could be interpreted in various ways. The interview data suggests that this group did not regard walking and cycling as pro-environmental behaviours; some set it apart as more to do with "health" or "personal interest" (male,

²¹ See appendix 4 for how the questions were scored.

²² 6 people is the minimum sample size for multidimensional scalogram analysis, which is relatively tolerant of small sample sizes (Barnett, 2004).

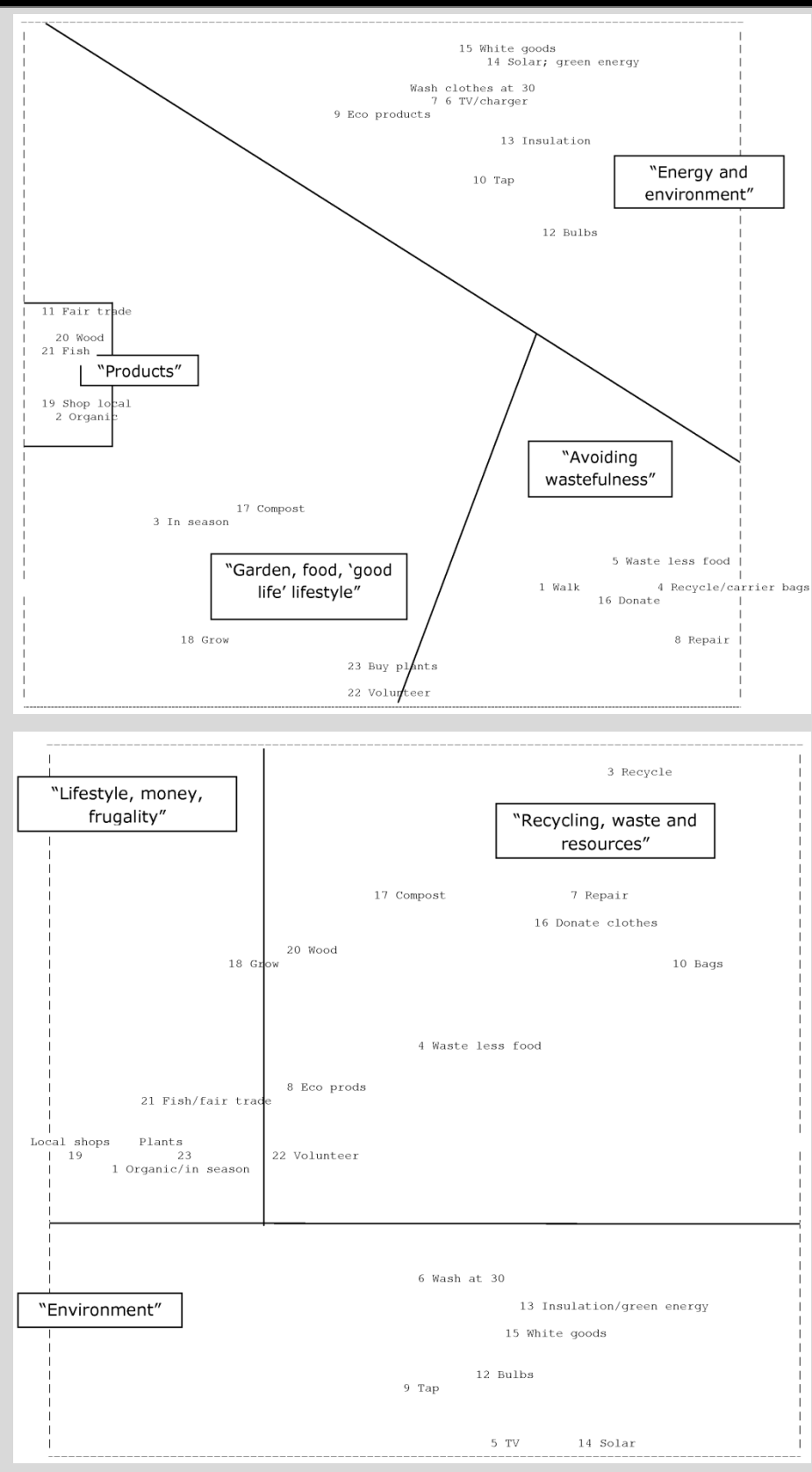
²³ Again, we cannot make any inferences from these background characteristics due to the small sample size.

26-35, ABC1); and others saw their personal travel habits, particularly regarding the car, in rather more practical terms:

“I probably just walk if there’s no car available or if I’m impatient and there’s no bus.”
(Male, 18-24, C2DE).

The results of the analysis with the outlier deleted are shown in Plot 3b.

Plots 3a and 3b: General behaviours' free sorts ('Behaviour type').
3a. Greens (top) and 3b. Non greens (bottom)



Comparison of the green and non-green plots suggests that the greens identified more defined, coherent categories of behaviours than the non-greens, whose plot shows a less coherent distribution. This signifies higher levels of consensus between the greens in terms of the constructs and category structures they used.

The weaker associations between the behaviours perceived by the non-greens could be suggestive of lower levels of awareness of the behaviours among this group. This could be explained by our tendency to assimilate knowledge according to what is relevant and important to us (Lord et al, 1979). It is possible that those for whom pro-environmental behaviours are less important may gather less information about these actions during their everyday lives and so have less common ground between them than the greens. It may also be the case that greater experience of a subject leads to conceptualisations at a higher degree of abstraction (Smith and Medin, 1981). This suggests that the greener participants, due to their higher levels of familiarity and experience with the behaviours, may have been more likely to ignore day to day 'noise' and focus on the similarity relationships.

It is notable that the greens' plot shows a well defined group of purchasing behaviours – that is, things one can *buy* to be 'green'. The interview data suggest that a common theme underlying this categorisation centred on making an effort to think about what to buy and being aware of a product's impact, or "what's going on behind the scenes" (male, 36-44, C2DE). For other participants, environmental considerations were not the main driver. Other green participants suggested that buying these kinds of products was a lifestyle choice (female, 36-45, ABC1) or that buying things like organic produce was simply a personal preference that happened to have positive environmental consequences (male, 46-55, ABC1).

Despite the differences in category size and structure between the greens and non-greens, the two groups used similar constructs to identify their categories. For example, both used "energy", "waste" and "lifestyle" categories. It is also interesting to note that the results of the whole sample 'behaviour type' free sorts (plots 1a and 1b) are more similar to the greens' plot (plot 3a). This suggests that the middle-of-the-road group who were excluded from this part of the analysis tend more towards the green patterns of 'behaviour type' categorisation, whereas the non-green group were a particularly distinctive subset of the sample. The uniqueness of the non-greens' conceptualisations is echoed by Defra's pro-environmental segmentation model, which shows that the *honestly disengaged* group (the segment with the least engagement with environmental issues) has particularly distinctive characteristics in terms of their attitudes and behaviours (Defra, 2008).

3.6.4. Structured sorts

As well as free and semi-structured sorts, in which the participant decided on the categories and constructs to be used, three structured sorts were included in the interview programme, in which the researcher specified the basis of the sort and the category descriptions to be used (see table 2). These structured sorts were analysed using smallest space analysis, which can be used with ordinal data (in contrast to multidimensional scalogram analysis, which is suited to the nominal data generated by free sorts).²⁴ In other words, where there is some order relationship between the categories used, we can employ a slightly different analysis to explore the underlying relationships.

²⁴ Smallest space analysis tests the relationship of every behaviour with every other behaviour within the confines of the theme of the sort in order to reveal fundamental order relations within the data. The smallest space analysis procedure generates a similarity matrix based on correlation coefficients that is then visually represented as a plot.

Smallest space analysis was used in this project to explore the differences between the cognitive processes underlying the categorisations of the greens and the non-greens. In contrast to multidimensional scalogram analysis, which maps relationships between *behaviours*, smallest space analysis can be used to map differences and similarities between *different types of people*.

For the first structured sort, participants were asked to sort the behaviours into things they did always, sometimes or never (see table 6 for a ranking of behaviours from most to least popular). Plot 4, on which the points are *people*, rather than behaviours, shows the results of this structured sort for the greens and non-greens.²⁵

Figure 1 is a map of the study area, showing the location of the 12 sampling stations. The map is divided into a 'Non-green' area (top) and a 'Green' area (bottom) by a horizontal dotted line. A vertical dotted line also divides the map. A black line with a step-like feature separates the two areas. Sampling stations are marked with red squares (1-12) and green squares (1-12).

Table 7, showing the average category size for the two groups, may help to explain the fundamental difference between how the two groups sorted. We can see that the greens' "always" category contained

56

more behaviours than average and the non-greens' contained fewer; and the non-greens' "never" category was bigger than the average, and the greens' was smaller. These clear differences in category size are the most likely explanation for the differences in category content that cause the distinction between the two groups on the plot. As with all the findings of this pilot exercise, this suggestion would have to be tested on a much larger scale to check its reliability.

Structured sort 2: which behaviours came first?

Next, participants were asked to sort the behaviours that they always or sometimes did into behaviours that they did "earlier" and "later". The aim of this sort was to explore the order in which behaviours were taken up.

Table 8 below shows the differences in order of uptake between the greens (top half of the table - persons 1, 3, 5, 6, 9, 13) and the non-greens (bottom half of the table - persons 4, 7, 8, 10, 16, 17, 18).²⁶

Table 8 shows each behaviour, person by person. An orange square with a 1 indicates that the behaviour was categorised as an 'earlier' behaviour by that person; a yellow square with a 2 indicates a 'later' behaviour; and a blank square indicates that that person does not participate in that behaviour.

The behaviours have been ordered very roughly from those most frequently put into the 'earlier' category to those most frequently put into the 'later' category.²⁷ This table can only give a very rough overview of the patterns of 'early' and 'late' uptake of behaviours, based as it is on an entirely subjective²⁸, two point scale. However, it can give us some idea of overall patterns. For example:

- All of the green participants reported that donating clothes to charity and recycling were behaviours they had adopted early on.
- The green participants who bought sustainable timber products, washed at 30 degrees and grew their own vegetables said these were things they had started to do more recently.

In terms of the patterns of early and late uptake, the table fits with what we know about recycling and 'greenness' in that all six green participants stated that they started to recycle 'earlier', whereas three out of the five non-green participants (one of the six non-greens refused this sort) reported that they started doing this 'later.' On the other hand, all of the non-green participants said they walked or cycled 'earlier', whereas some green participants admitted to only taking up this behaviour 'later.' This difference indicates that a simple question about walking or cycling is not necessarily diagnostic of green attitudes or motivations, which is supported by the reasons participants gave for walking or cycling (see section 3.6.2).

The table also shows that the green group were self-reported early adopters of behaviours such as 'avoid single use carrier bags', 'buy organic vegetables', 'switch TV and mobile phone charger off at the plug' and 'buy eco-friendly cleaning and laundry products.' Interestingly, the non-greens reported using energy

²⁶ Because each person had different behaviours in their always and sometimes categories, the data resulting from this sort is not suitable for smallest space analysis.

²⁷ These figures must be treated with extreme caution, since each mean is calculated from a different base – i.e., the number of people who performed the behaviour always or sometimes. For example, note that only 5 people said they always or sometimes composted food and garden waste, but out of these five, most did it 'earlier' rather than 'later', hence its low mean score.

²⁸ For example, each person may have had in mind a different timescale when categorising behaviours into 'earlier' and 'later'.

efficient light bulbs earlier, and 'waste less food' seems to have been taken up early by both groups. These two actions were the only behaviours that every single participant performed always or sometimes.

Unsurprisingly, there were a number of behaviours that the non-green group did not do at all, that some greens did always or sometimes. These behaviours were:

- install insulation;
- compost food and garden waste on a compost heap at home;
- volunteer in environmental or conservation projects;
- grow fruit and vegetables;
- switch to a green energy tariff;
- buy sustainable wood products.

Table 8 Structured sort 3: did you take up these behaviours earlier or later? Greens and non-greens

	Count	15	11	5	5	17	17	14	15	3	11	16	13	6	8	14	16	14	17	9	3	9	10	15	4
	%**	88	65	29	29	10	100	82	88	18	65	94	76	35	47	82	94	82	100	53	18	53	59	88	24
		Donate old clothes to charity	Repair old or damaged clothes	Have insulation installed	Compost food or garden waste at home in a compost bin/heap	Walk or cycle for short journeys	Waste less food	Shop in local shops or markets rather than the supermarket	Turn off the tap while cleaning teeth	Volunteer in environmental conservation and /or wildlife projects	Buy energy efficient white goods (e.g. fridges, washing machines)	Recycle (e.g. plastic bottles, paper etc)	Switch TV and mobile phone charger off at the plug	Grow fruit and vegetables	Buy plants and create habitats that encourage wildlife in the garden	Eat fruit and vegetables that are in season	Avoid using single use carrier bags	Buy organic vegetables	Use energy efficient lightbulbs	Buy eco-friendly cleaning and laundry products	Switch to a green energy company or tariff	Buy sustainable fish products (such as MSC certified fish)	Wash clothes at 30 degrees	Buy fair trade products	Buy sustainable wood products (such as FSC certified timber)
Greens	P1	1	1			2	1	1	1		1	1	1		2	2	2	2	1	1			2	2	
	P3	1				1	1	2	2			1	1	2	2	2	1	2	2	2		2		2	
	P5	1	2		1	1	2	1	1		1	1	2	2	1	1	2	1	2	1		2	2	1	2
	P6	1	1	1	1	1	1		1			1			1		1		2					2	
	P9	1		1	1	1	1	1	2	1	1	1		1	1	1	1	1	2	2	1	1		2	2
	P13	1	1	2	2	2	1	1	1		2	1	2	2	2	1	2	1	2			2	2	2	2
Non-greens	P4	1				1	2	2	1			1				2	1	2	2					2	
	P7					1	1	2	1			2	2						1						
	P8	1	1			1	1		2		1	2	2				2		1						
	P10		1			1	1	1			2	1			2	2	2	2	1	2			1	2	
	P16	1				1	1	1	2		2	2	2			2	2	2	2			2	2	2	
	P18***																								

* How many people in the 17 people who completed the sort do this behaviour always or sometimes

** What % of the 17 people does this always or sometimes

*** P18 refused to do this sort, stating it did not make sense

Overall, the sorts showed, unsurprisingly, that the green group not only perform more pro-environmental behaviours, but that they also took up most of these behaviours earlier than the non-greens.

After performing this structured sort, participants discussed what made them start doing these actions. They were asked whether they thought there was any relationship between their 'earlier' and 'later' groups or whether they thought that any particular behaviours had led on to any other particular behaviours.

After some thought, some participants came up with examples of behaviours they stated had led on to other things. It is important to note, however, that although some participants were able to make links between some earlier and later behaviours, there is no way of knowing whether this was a post-rationalisation or a genuine recollection of what caused them to adopt new behaviours.

One participant (male, 46-55, ABC1) said that buying organic vegetables had spurred him on to start growing his own. Another (male, 26-35, ABC1) said that shopping in local shops had made him realise that supermarkets don't necessarily offer the best products, which may have made him consider fair trade, organic and seasonal produce. Another (female, 26-35, ABC1) thought that repairing and customising her clothes had spilled over to other waste behaviours such as recycling, wasting less food, avoiding supermarket carrier bags and even walking more.

"Realising that you can reuse them makes you apply it to other things. It's about not being unnecessarily wasteful."
(Female, 26-35, C2DE)

Other participants did not isolate specific trigger behaviours and talked in more general terms about a more 'evolutionary' type of gradual behaviour change.

"It's a progression of understanding and thinking more about the environment. And if they're money saving, all to the good."
(Female, 65+, ABC1)

"It led on in general. I can't think how."
(Female, 26 – 35, C2DE)

"It's gradual, a change in awareness has made me change my habits."
(Female, 46 – 55, ABC1)

Structured sort 3

The final sort performed by all participants was based on the question, "If everyone did these behaviours, how much difference would they make to the environment?" The categories available were "a huge amount", "a bit" and "not much at all." No clear patterns emerged from smallest space analyses that plotted the people or the behaviours. In the case of the analysis that plotted people, this indicates no fundamental difference between the way the green and non-green groups categorised. In the case of the analysis of the

behaviours themselves, the absence of clear regions on the plot indicates an absence of any strong underlying relationships underpinning the distribution of cards.

It is important to note that this sort may be limited by the subjective nature of the categories specified (it may be better to treat them as nominal rather than ordinal categories) and also by the fact that only a three point scale was used. Further research using a more differentiating scale could well find more distinction between the behaviours and between how greens and non-greens view them. Additionally, this kind of analysis does not control for the different amounts of knowledge different participants may have had of the subject, which, if incorporated, may again change the picture.

Bearing in mind these limitations, we nevertheless performed some simple analysis on the data. Table 9 ranks the behaviours in order from those most likely to be put into the “huge amount category” to those most likely to be put in the “not much at all” category based on the weighted average of how many times each behaviour was placed into each of the three categories.

Table 9 Mean score where 1 = “huge amount”, 2 = “a bit”, 3 = “not much at all”

Behaviour	Huge amount	A bit	Not much
1. Have insulation installed	15	2	1
2. Walk or cycle for short journeys	13	5	0
3. Recycle (e.g. plastic bottles, paper etc)	13	5	0
4. Have solar panels installed	13	4	1
5. Use energy efficient lightbulbs	12	6	0
6. Switch TV and mobile phone charger off at the plug	11	7	0
7. Buy energy efficient white goods (e.g. fridges, washing machines)	11	5	2
8. Turn off the tap while cleaning teeth	10	7	1
9. Wash clothes at 30 degrees	9	9	0
10. Avoid using single use carrier bags	9	9	0
11. Buy sustainable fish products (such as MSC certified fish)	9	8	1
12. Switch to a green energy company or tariff	9	7	2
13. Eat fruit and vegetables that are in season in the country where they are grown	8	9	1
14. Buy sustainable wood products (such as FSC certified timber)	9	6	3
15. Waste less food	8	8	2
16. Buy eco-friendly cleaning and laundry products	8	8	2
17. Grow fruit and vegetables	7	10	1
18. Compost food or garden waste at home in a compost bin/heap	6	11	1
19. Buy plants and create habitats that encourage wildlife in the garden	6	10	2
20. Buy organic vegetables	6	9	3

21. Shop in local shops or markets rather than the supermarket	6	9	3
22. Volunteer in environmental conservation and /or wildlife projects	4	13	1
23. Donate old clothes to charity	5	9	4
24. Buy fair trade products	5	7	6
25. Repair old or damaged clothes	4	9	5

This table shows that all of the behaviours were considered by participants to make at least some difference to the environment. There are no clear clusters of behaviour type within the rank order; for example, energy behaviours are scattered throughout the list, as are waste and purchasing behaviours. Neither do 'easy' and 'difficult' behaviours obviously cluster together, as they seem to in some of the other sorts. This suggests that 'things I do' was *not* a driving force behind these classifications, despite some grounds for expecting participants to judge their own actions as the ones that make the most difference (see the theory of cognitive dissonance, e.g. Thøgersen, 2004).

It is interesting to contrast the ranking of 'have insulation installed' as the top behaviour in table 9 with its appearance in the bottom quintile of the structured sort 1 data (things I do always, sometimes and never). This indicates a significant disconnect between the high levels of awareness about the importance for the environment of installing insulation on one hand and, on the other, actually performing this action. This may lend support to the conceptualisation of behaviour as a function of one's attitude toward that behaviour and the cost or difficulty of that behaviour (see e.g. Byrka, Kaiser and Hubner, forthcoming).

3.7 Specific domain: waste behaviours

By conducting the sorting exercise based on the general set of pro-environmental behaviours, we were able to investigate the perceived boundaries between different domains and why particular behaviours are perceived to 'go together'. In order to explore whether people categorised in similar ways and used similar constructs for behaviours belonging to a specific, more focused 'domain', we used a second set of cards, each showing a waste-related behaviour. This set, again agreed with Defra, was drawn from an extensive base of waste research evidence.

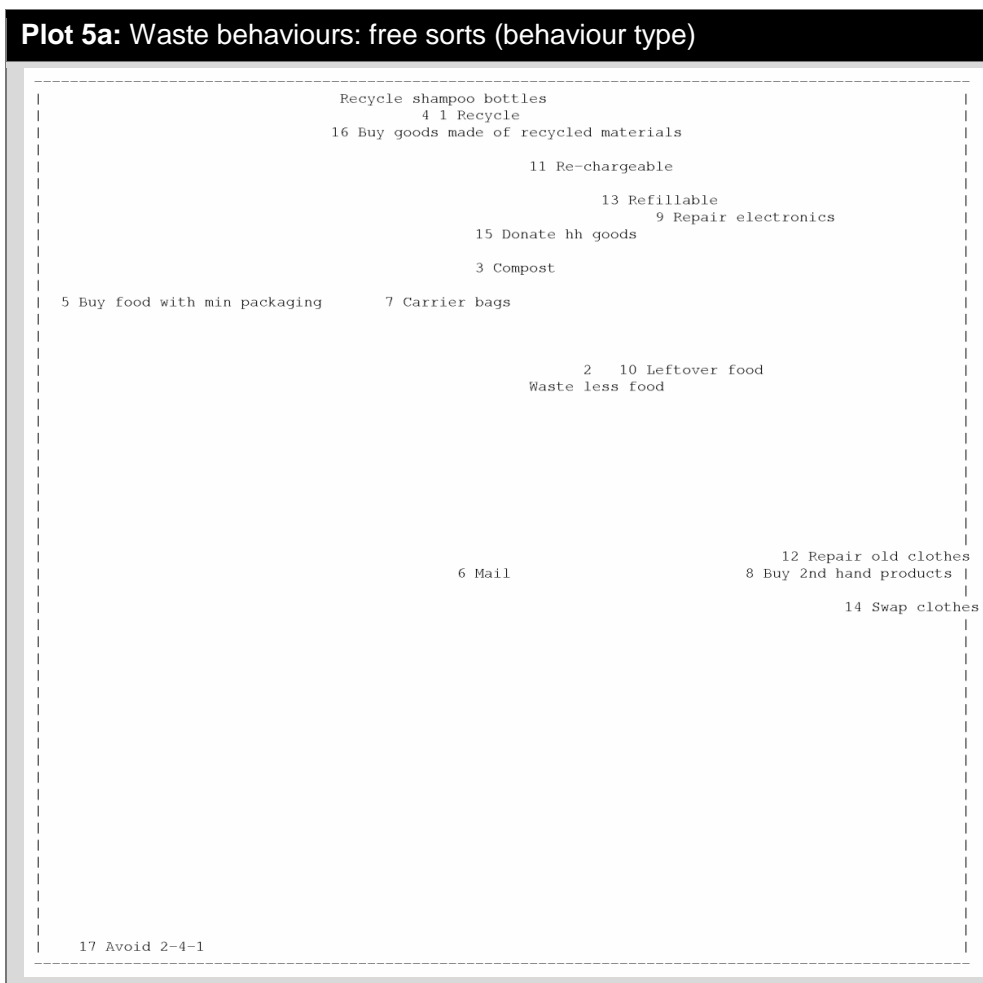
Table 10 Set of specific waste behaviours used for the second sorting exercise

Waste behaviours
1. Recycle
2. Waste less food
3. Compost food waste in a bin or compost heap at home
4. Recycle shampoo bottles
5. Buy food with minimal packaging
6. Use the mail preference service to prevent junk mail
7. Avoid using single use carrier bags
8. Buy second hand products (e.g. furniture, clothes, etc)

9.	Repair electronic goods when they're broken
10.	Use leftover food
11.	Use re-chargeable batteries
12.	Repair old or damaged clothes
13.	Buy refillable products (e.g. cleaning products, ink cartridges)
14.	Swap clothes with people I know
15.	Donate household goods (e.g. furniture, electrical goods) to charity
16.	Buy household goods made of recycled materials
17.	Avoid two-for-one or similar offers on short life products

Only eight participants had time to complete the exercise with the waste cards. However, as already mentioned, the multiple sorting procedure and multidimensional scalogram analysis are tolerant of small sample sizes; data from eight individuals is sufficient to generate some insight into the categories and constructs used in this slightly different context (although this sample size is not large enough to make inferences about the effects of background characteristics such as age on the way in which behaviours are conceptualised).

The second set of cards contained four elements identical to elements in the main set of general cards. It also contained fewer behaviours (17 compared to 25 in the main set). The participants who completed this exercise were invited to do free sorts only. The results are shown in plot 5a below:

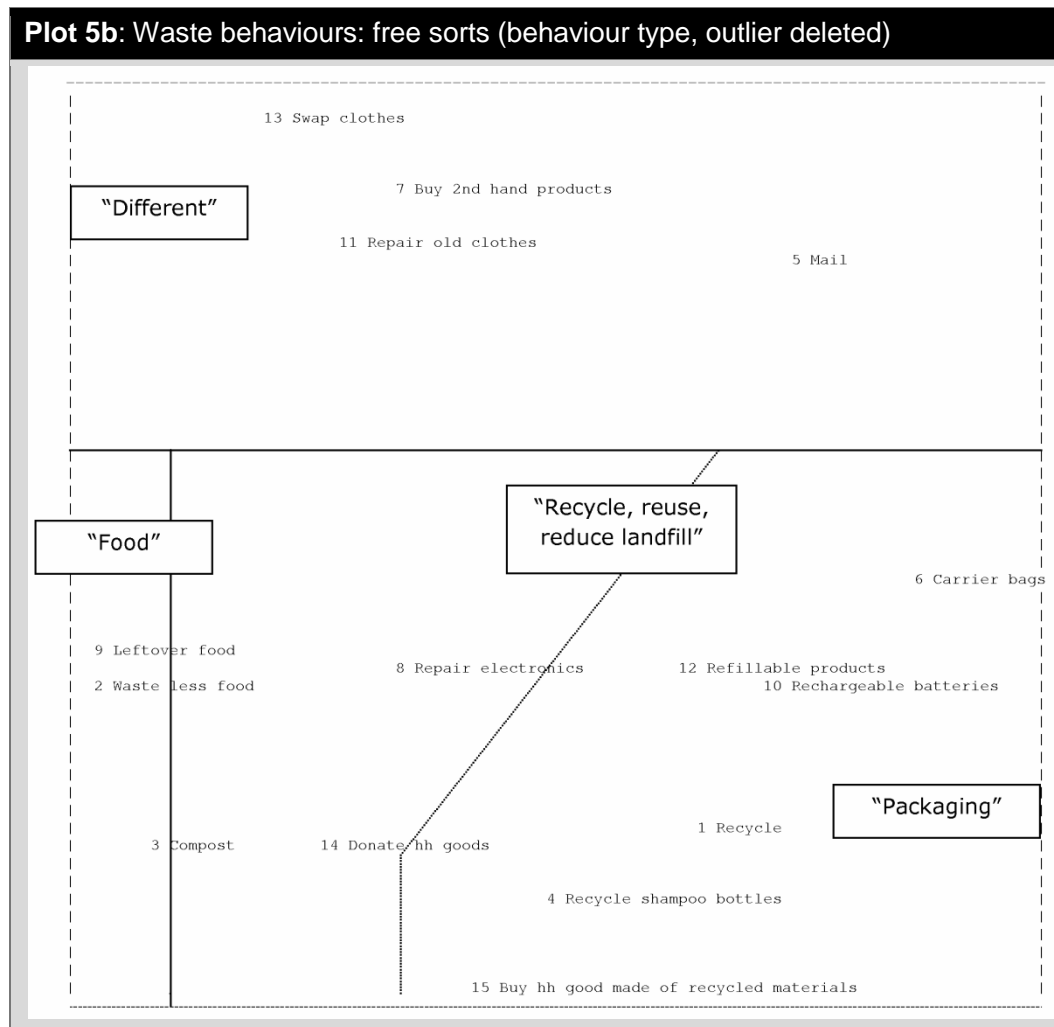


It is clear from the plot that one behaviour was seen very differently and categorised separately by the majority of people. ‘Avoid two for one offers on short life products’ was met with surprise and uncertainty by most participants:

“I’ve got no idea about this one. I always go for two for ones!”
(Female, 65+, ABC1)

“This one’s on its own - it’s not to do with wasting.”
(Male, 18-24, C2DE)

Since this behaviour was seen so differently by most participants, it is located at a disproportionate distance from the other behaviours on the plot, thereby skewing the plot and causing all the other points to be squeezed into one small area. In order to interpret the other behaviours and see the patterns in the main group, it was necessary to remove the outlier and re-analyse the distribution (see Lingoes, 1977 for justification and more details).



By deleting the outlier, we can see a much clearer distribution of behaviours on this plot. The main group of behaviours towards the bottom of the plot is loosely held together by constructs such as “waste not, want not” (female, 65+, ABC1); and “avoiding waste” (male, 18-24, C2DE). The interview data reveal that the behaviours at the top were put together for two main reasons. Firstly, they simply do not fit very well with the rest of the behaviours:

“These ones are just different.”
(Male, 65+. C2DE)

A second reason for keeping these apart centres on the ‘type of person’ who is perceived to behave in this kind of way:

“These are the less optimal choice. They all seem a bit...the type of person who would do these is different.”
(Male, 18-24, C2DE)

Overall, we can see that the plot of free sorts for waste behaviours shows a relatively diffuse distribution of points. The plot is clearly divided into two sections, with the behaviours that ‘go together’ because they are

to do with waste (bottom region of the plot), and the 'others' that were perceived not to fit in at the top. Other than this, some clusters do emerge, notably the food behaviours and perhaps actions around packaging. However, in general, there were no particularly strong differentiations made between the waste behaviours and participants found it more difficult to identify distinctive sub-groups than they did with the more general behaviours.

Although this plot is based on a very small sample and relatively few behaviours, it may be possible to compare this to other, larger scale work on waste. For example, Tucker and Douglas (2006) find that waste prevention behaviours have an underlying structure that can be subcategorised as:

- point of purchase activities;
- pre-emptive choice long life/durable products;
- private reuse;
- valorisation of unwanted goods; and
- minimising the purchase of new resources

It is possible that, for example, behaviours 12 (buy refillable products) and 10 (use rechargeable batteries) on plot 5b are grouped together because they are 'pre-emptive choices of long life/durable products,' although this is not how the participants referred to their categories. Some participants did use categories that echoed Tucker and Douglas' groups; for example, "It's about not using a new one every time" (male, 56-64, ABC1) corresponds to the group of 'minimising the purchase of new resources'.

Similarly, the categories identified by our small number of participants seem to reflect Barr's (2005) findings that recycling behaviours generally cluster together, although it is worth noting that, despite the recycling behaviours' proximity on the plot, participants did not consciously or semantically differentiate between recycling and the other behaviours in the set.

The general absence of defined categories on the top plot suggests that participants did not have a strong shared way of thinking about the behaviours. Participants set about performing the waste behaviour free sorts in the same way as the general behaviour sorts: 'behaviour type' and 'things I do' were the two main sort themes to emerge and some of the constructs used were also similar to those used for the general behaviours, such as 'ways to save money', 'things we do at home' and 'ways to help the community.' However, participants generally found it more difficult to differentiate between the waste behaviours and tended to want to put them all together as a set of waste behaviours, often setting apart only the ones that they perceived not to fit with the main group.

3.8 Some observations on how people sorted

The way in which participants performed free sorts on both the general and specific behaviours could be described as 'impromptu' or 'ad hoc' (Barsalou, 1991), rather than well established, pre-constructed categorisations. Thinking about pro-environmental behaviours seemed to be a novel exercise for most participants and it seemed that participants were not drawing on well established categories but rather constructing these in response to the demands of the task. Moreover, participants' categories were fluid and malleable, with some people trying various combinations of cards until they were happy to say they had

finished the sort. In some cases, the fluidity of categories was reflected in reports of actual behaviour, which seemed to be subject to various internal and external factors:

"It depends if I'm feeling in a particularly green mood. Most of the time I'm not."
[Buy eco-friendly products]
(Male, 26 – 35, ABC1)

In terms of how they set about deciding how to group the behaviours, most participants took the approach of starting with the 'obvious' behaviours that were perhaps most familiar or in some way put participants in mind of a potential category, and then built up their categories around these 'core' behaviours. In this way, some behaviours were treated as good exemplars (or 'prototypes') of a category, whereas others in the category were much less strongly associated with the core idea. Sometimes participants were happy to leave these 'bad' exemplars in a category, whereas on other occasions they took them out and put them on their own. Some participants found particular behaviours extremely difficult to categorise and spent long periods of time agonising over where they belonged. However, examination of the interview data suggests that there did not seem to be any pattern to this – each person generally had different 'odd ones out.'

There were also some differences in the ways different people approached the exercise. Some participants performed their free sorts very quickly and intuitively, whereas others took as long as 15 minutes to sit and think about what they were going to do before they started. However, these differences in approach seemed unrelated to participants' 'greenness' or 'non-greenness', which suggests that the approach taken was not a simple function of familiarity with, or tendency to do, the behaviours.

Finally, it was interesting to note that many of the constructs used by participants to describe categories were complex and multilayered. They often did not use simple constructs such as "waste" to describe a category; rather, they used a combination of ideas such as "things I do to avoid being unnecessarily wasteful that save me money and that I feel guilty when I don't do" (female, 36 – 45, ABC1). Participants generally did not categorise the behaviours simply as "environment" or "food" type behaviours, but their categories were highly personal, contextual and influenced by a number of different constructs that were pertinent to participants' own lives.

3.9 Discussion of the pilot exercise findings

The objective of the pilot exercise was to examine how people categorise pro-environmental behaviours; the connections they perceive to exist between them and the personal meaning participants attached to the behaviours and their associated categories. We aimed to explore the perceived relationships between different pro-environmental behaviours as the first step in understanding possible catalyst effects between behaviours. Since spillover depends by definition on some kind of relationship between behaviours, and the literature suggests that spillover is most likely to occur between conceptually 'similar' behaviours (see section 3.1), understanding what constitutes *similarity* is a crucial step in understanding how different behaviours may catalyse the uptake of other behaviours.

The results of the pilot exercise show that what constitutes 'similarity' amongst the pro-environmental behaviours is highly personal – participants used their own lives, experience and knowledge to think about and categorise the behaviours. Moreover, it became clear that 'environment' is not a central construct in most participants' day to day conceptual systems. In other words, most participants do not think about the

environment or incorporate environmental concern into their decision making, even about behaviours that are often classed by experts as ‘pro-environmental.’ The constructs participants used to describe categories of pro-environmental behaviours (see figure 1) and some of the reasons people gave for participating in behaviours demonstrate that the environment was generally not a central concern or motivation for most participants:

“I’m trying to get rid of my baby weight. It’s totally selfish really.”

[Walk or cycle for short trips]

(Female, 26 – 35, C2DE)

“I did it to save money and because of the thought of fire and not wasting electricity.”

[Switch TV and mobile charger off at the plug]

(Female, 46 – 55, ABC1)

It was notable that the energy related behaviours in the set were conceptualised by participants as separate from waste behaviours and ‘lifestyle’ behaviours such as purchasing. In general, it was the energy related actions in the set of general behaviours that were perceived most strongly as pro-environmental, perhaps because of the climate change focus of most campaigns in the UK at the moment. Indeed, many people mentioned that seeing adverts and picking up messages from the media had contributed to their pro-environmental behaviour. This suggests that campaigns may have an effect on people’s pro-environmental categories, perhaps by highlighting the links between behaviours with reference to a common goal – saving energy to reduce carbon emissions in order to tackle climate change.

This leads on to the question of how people’s categories are related to their behaviour. Participants performed their free sorts on the basis of one of two main themes: ‘things I do’ or ‘behaviour types.’ These two sort types have different origins and therefore different cognitive structures, indicated by the different distributions of behaviours on the plots. There is a simple, direct, descriptive relationship between the ‘things I do’ sort theme and action in real life. However, the fundamental difference between ‘things I do’ and ‘behaviour types’ suggests that actual behaviour patterns and relationships do not match ‘behaviour type’ categorisations.

The ‘behaviour type’ sort theme is the kind of ‘family resemblance’ or taxonomic categorisation that is an assumption in many of the mechanisms suggested in the literature to explain spillover. For example, consistency theories such as cognitive dissonance are based on the assumption that perceived (in)consistency depends on the behaviours in question as being evaluated as similar in some way, for example being linked by a common goal.

The differences between the ‘behaviour type’ and ‘things I do’ plots may therefore pose a problem for many of the psychological mechanisms proposed to explain spillover. The observation that participants’ family resemblance categorisations did not map onto their reported behaviour patterns suggests that ‘family resemblance’ does not provide the basis for striving to behave consistently. For example, it appears that despite recognising that ‘energy’ behaviours are similar and belong to the same category, most participants did not consistently perform those ‘energy’ behaviours. Moreover, participants did not report that this inconsistent behaviour towards a taxonomic behavioural category made them feel uneasy. In other words, perceived similarity did not translate into consistent behaviour, and inconsistent behaviour with regard to a taxonomic category did not produce cognitive dissonance.

The fact that ‘behaviour type’ did not seem to be a dominant factor in determining ‘things I do’ could be interpreted in different ways. One possible explanation is that behaviour type *is* in fact an important construct underpinning what people do, but is suppressed by the other considerations such as the cost or difficulty of the behaviours. In this case, we might expect ‘ease or difficulty of doing the behaviour’ to be an important construct determining the distribution of the ‘things I do’ plot and therefore what people actually do in real life. Indeed, looking at the ‘things I do’ plot (plot 1c), it is possible to see a separate ‘behaviour type’ cluster of purchasing behaviours within the easier behaviours towards the bottom of the plot, whereas the most difficult, costly behaviours at the top of the plot are a mixture of behaviours types. In other words, behaviour type is ‘trumped’ by difficulty. However, any potential groupings in the ‘easy’ region of the plot are very loose and suggest, at most, only a very weak influence of ‘behaviour type’ on this plot.

Another possible explanation for the disconnect between ‘behaviour type’ categorisations and what people actually do could lie in the nature of the set of behaviours used for the sorting exercise. As already mentioned, our set of pro-environmental behaviours was not a ‘natural’ set that people had considered before – thinking of these behaviours together as a group was new to most participants. It seems to be the case that the constructed nature of this set of pro-environmental behaviours was at odds with people’s existing categories and did not fit easily into participants’ existing conceptual systems. As demonstrated above, participants did not have well established environmental behaviour categories and ‘environment’ as a construct seemed to be mainly peripheral in everyday behavioural choices. This would suggest that we cannot use people’s environmental categories to understand their environmental attitudes and behaviours, since these categories are not firmly established (they are ad hoc) and hence do not play a part in people’s actual behaviours. There may be some very ‘green’ people who do have established environmental categories and incorporate environmental concerns into their everyday behavioural choices. However, the pilot exercise suggests that other, non-environmental categories and constructs provide the main underpinning of most people’s everyday behaviours.

A final suggestion for the differences between the ‘behaviour type’ and ‘things I do’ categorisations is that, although people may, in general, strive for consistency, ‘behaviour’ type does not provide a framework for consistency among the pro-environmental behaviours. In other words, behaving inconsistently with regard to ‘waste’ or ‘energy’ behaviours does not register as inconsistent in the minds of most people. It is even possible to speculate that participants’ taxonomic categories were based on observations of what they thought other people did, or perhaps influenced by some social desirability bias in the context of the interview. Whatever the reason, the gap between taxonomic similarity and actual behaviour suggests that perceived consistency (and inconsistency) stem from some other perceived relationship between pro-environmental behaviours - perhaps, for example, a link based on a common goal. This possibility was not specifically examined during this research, but the evidence suggests that a common goal may constitute an underlying relationship between pro-environmental behaviours (e.g. Kaiser and Wilson, 2004). Participants did not sort on this basis, suggesting that a common goal may be a ‘latent’ or un-activated relationship for most people. This, in combination with the suggestion that most people do not conceptualise many of the behaviours as explicitly ‘environmental’, could explain why many people seem to behave ‘inconsistently’ toward the environment in the eyes of environmental experts.

All this suggests that spillover between pro-environmental behaviours may be unlikely to occur naturally for most people because (a) perceived links between behaviours are often not based on environmental

constructs and (b) relationships that *are* based on environmental constructs are often suppressed in reality by more practical considerations, such as the ease or difficulty of performing the behaviour.

It seems that spillover through a consistency mechanism is most likely to occur where:

- there is a clear goal; and
- that goal relates to one salient dimension of a set of behaviours; and
- the barriers to new behaviours along this dimension are low.

For example, if a person has the goal of becoming more healthy, and begins cycling for health reasons (i.e. the 'health' dimension of cycling is particularly salient), performing this action could lead to other healthy changes such as improved diet.

3.10 Limitations of the methodology

The main advantage of using the multiple sorting procedure and multidimensional scaling techniques is the ability to collect rich, qualitative data that can also be analysed in a systematic fashion. Unlike more traditional methods (such as cluster analysis – see section 4 below), this methodology allowed us to not only ascertain which behaviours are perceived to go together, but crucially, the *reasons why* people categorised the behaviours the way they did. Using this methodology allowed us to collect and demonstrate the importance of what is generally considered to be 'contextual noise' – the real life considerations that influence people's real behavioural choices outside the lab and experimental survey conditions.

Another related advantage is that our participants found the multiple sorting procedure an engaging, interesting task and many commented at the end that they had enjoyed doing it. That participants enjoyed the task helped to create the conditions in which they were open to talking about their behavioural choices, motivations, views and so on, which enhanced the quality of the interview data we collected. Participants were able to use their own conceptualisations of the behaviours, rather than ones imposed by the researcher. Aside from investigating categorisation, this method therefore offers many benefits as a qualitative means of exploring pro-environmental behaviours.

As with any methodology, however, this one has its limitations. The judgements participants made were highly dependent on how the sorting exercise was framed. This is particularly important for the subject of pro-environmental behaviours, which, as we have seen, does not benefit from well established personal norms and categories. We introduced the study as research about 'lifestyles', in order to try to avoid, as far as possible, priming their environmental values before they started. However, although the set of behaviours was not identified as being all about the environment by some participants, the question remains as to how the pro-environmental behaviours would have been treated if they had, for example, been included in a wider set of non-environmental lifestyle behaviours. As we have seen, the classification of most of these behaviours as simply 'pro-environmental' is problematic, but further research would be needed to see if the pro-environmental behaviours formed more coherent groups when embedded in wider, non-environmental behaviours.

Related to this is the issue of language. It is possible that the words we used to describe the behaviours influenced how they were categorised – for example, it is possible that some people may have picked up on

a common word, such as “buy”, and used this as the basis for a category. This methodology is sometimes used with images rather than words (e.g. Wilson and Mackenzie, 2000), which avoids this problem. Using images would also avoid the problem of participants who struggled with reading (as was the case with one participant in the pilot study). In the context of this project, the research team decided against using images because of the difficulty of visually representing most of the behaviours and the risk of influencing participants through the style of the images.

A similar question about language centres on the social acceptability of behaviours framed in different ways. For example, it could be the case that ‘purchase items on ebay’ would not have been treated as an outlier in the same way as ‘buy second hand products’ was. Overall, however, whether images or carefully chosen words are used for the multiple sorting procedure, the elements should leave as little room for interpretation as possible. The more concrete and clear the elements are to participants, the more successful the exercise is likely to be.

The other main limitations of the pilot exercise were the small, non-representative sample and the very rough differentiation we made between the ‘greens’ and the ‘non-greens’. Larger scale research could use a representative sample and also focus on a finer distinction between types of individual – for example, the Defra segments.

3.11 Further categories research

Further research of this type could test some of the hypotheses emerging from the pilot exercise. For example, the marked difference between the categorisations of greens and non-greens in this research suggests that this might be a useful methodology for exploring how the different Defra segments conceptualise the behaviours. It is possible to hypothesise that the Positive Green segment’s conceptual systems would include more established pro-environmental behavioural categories that were used in behavioural decision making and therefore their ‘behaviour type’ categories would bear stronger resemblance to their actual behavioural patterns. In contrast, it may be the case that the Honestly Disengaged group do not use any kind of environmental constructs in their categorisations and therefore their ‘behaviour type’ plots of the pro-environmental behaviours would bear little resemblance to what they actually do.

Confirming a hypothesis such as this could provide a strong basis on which to design targeted communication and action based campaigns for each segment. Knowledge of the segments’ categories and how these relate to their behaviour would provide a much richer picture of their behavioural patterns, the relationships between different behaviours and the longer term effects on individuals in that segment of encouraging participation in certain behaviours.

This methodology is also amenable to longitudinal research design, whereby conceptualisations could be tracked over time, perhaps to test the effects of different kinds of campaigns or interventions or just to track the ‘natural’ evolution of people’s conceptual frameworks around environmental issues. The method could also potentially be used with a specific purpose in mind. For example, a variation on the ‘What did you do earlier/later’ sort could be used to build up a picture of the ‘life stories’ of environmental early (or late) adopters, with a view to isolating catalyst events.

More ideas and thoughts about action-based research based on this work may be found at the end of section 6.

4 Cluster analysis on the Defra behaviours and attitudes survey

Throughout this research, we have seen that an important indicator of relationships (catalyst or otherwise) between pro-environmental behaviours is the behaviours' tendency to co-occur. The pilot fieldwork exercise investigated the links between the behaviours that exist at a cognitive level among different individuals. As a supplementary exercise, a cluster analysis was performed²⁹ on data derived from the Defra pro-environmental attitudes and behaviours survey (n=3,618) (BMRB, 2007)³⁰. Cluster analysis entails the grouping of observations (in our case, patterns of survey responses) into subsets such that responses in the same subset are similar in some way. The aim of this exercise was to investigate the co-occurrence of pro-environmental behaviours across a larger, representative sample of the British public.

4.1 Methodology

In order to investigate the co-occurrence of behaviours, the first step was to identify the survey questions relating to behaviours and exclude those relating to attitudes. In a minority of instances, an attitude question was combined with a behaviour question to provide meaning; for example, we combined a question about number of flights taken with the attitude question "People who fly should bear the cost of the environmental damage that air travel causes [strongly agree]".

To reduce the number of variables and in keeping with our aim to investigate co-occurrence of pro-environmental behaviours, we selected the positive responses to the questions on pro-environmental behaviours (or, in some cases, the negative answers to non environmental behaviours). However, as the analysis below demonstrates, patterns of *non-occurrence* are also picked up by a cluster analysis: the similarity of the behaviours in a subset may lie in the fact that they are rarely performed by most people (see below for examples).

We first analysed the responses of the entire sample. The survey questions are organised into domains such as 'energy' and 'transport'; however, this first analysis included all questions on all behaviours so was unconstrained by pre-identified domains. This allowed us to explore any 'cross-domain' clusters. We next analysed behaviours by 'domains', which corresponded to sections of the survey – for example, energy behaviours, transport behaviours, and purchasing behaviours. This highlighted clusters of behaviours within specific, pre-identified domains. Finally, we repeated the specific domain/question analyses for each of the seven Defra segments. The aim of this was to investigate different patterns of co-occurrence among people with different attitudes towards the environment.

Cluster analysis first of all calculates pair-wise coefficients of proximity for all cases (behaviours). The 'closer' or more alike two behaviours are, the smaller the coefficient of proximity. The next step is to identify the two most similar behaviours and join them together into a cluster. The next step identifies the next closest

²⁹ Cluster analysis performed on behalf of Brook Lyndhurst by Mohammad Ali, Environment Statistics Service, Defra.

³⁰ Survey of Public Attitudes towards the Environment, 2007.
<http://www.defra.gov.uk/environment/statistics/pubatt/>

behaviour, and joins this to the cluster. This process continues until all the behaviours are brought into one large cluster; consequently, interpretation is required to identify which are the significant clusters within the dendrogram.

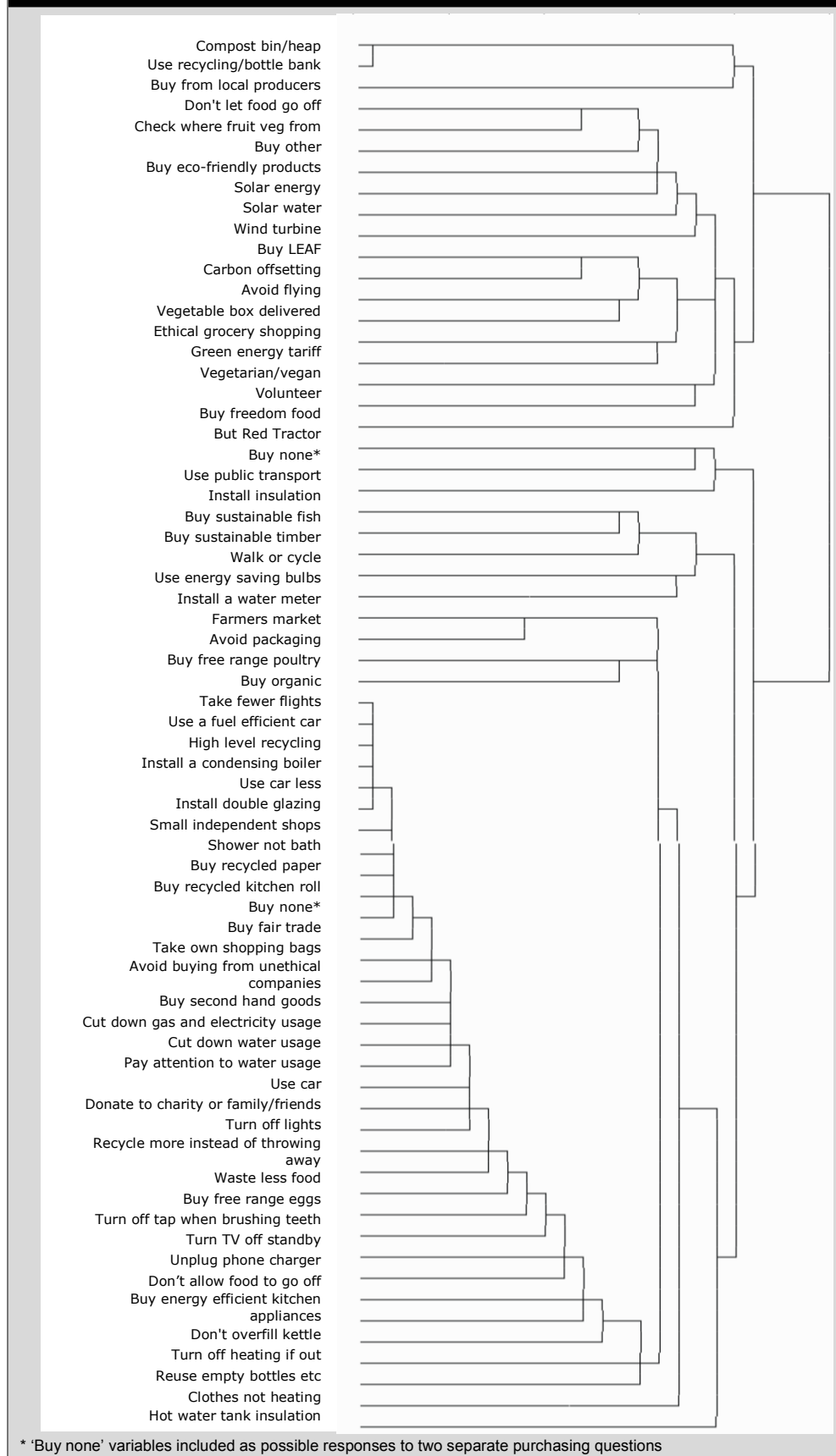
The outputs of the cluster analysis included cross tabulations, proximity matrices and dendograms (a type of tree diagram). The latter are an easily accessible visual representation of the output of the cluster analysis, and some examples are shown below. The vertical order of the behaviours in the dendrogram represents the order in which they were brought into the clusters; the horizontal branches, derived from the coefficients of proximity, represent the distance between behaviours. The smaller the coefficient, the 'closer' the behaviours; so, for example, two behaviours linked by a very short branch are more alike than two behaviours linked by a long branch. Visually, this means that many behaviours linked by short branches form a tight cluster of similar behaviours, whereas longer branches indicate that the behaviours are less similar (further away from) to each other. The number of branch connections represents the directness of the path or relationship between the behaviours.³¹ The dendograms must be interpreted in conjunction with the cross tabulations and proximity matrices. These contain the details of the number of positive responses for each behaviour and set of behaviours, and consequently the direction of the relationship between behaviours – that is, whether behaviours are associated by their *co-occurrence* or their mutual *non-occurrence*.

Figure 3 overleaf shows the dendrogram representing the cluster analysis of all behaviours for the entire sample.³²

³¹ It is important to note that this analysis was designed with the specific purpose of adding another dimension to our investigation of co-occurrence and relationships among behaviours. In order to use this analysis for other purposes or to explore specific questions, re-specification of the data, further analysis and quality assurance would be required.

³² Note that in this and all the dendograms in this section, individual behaviours have been re-numbered for ease of reference, so the same behaviour may have a different number in different diagrams. Also, the wording of some questions has been altered for brevity. The full survey with original coding and wording is available at the link in footnote 25 above.

Figure 3 Dendrogram of all behaviours; entire sample



4.2 All behaviours

The analysis of all 66 selected behaviour variables is shown in figure 3. The overall picture provided by the dendrogram is that there are very few clear clusters of similar behaviours. The diagram shows that there were relatively large distances between behaviours and clusters, indicating that in general, the behaviours in the survey are not 'alike' in terms of being performed consistently.

The clearest clusters are found amongst the least common pro-environmental behaviours, such as 'install domestic microgeneration', 'participate in carbon offsetting schemes' and various ethical purchasing behaviours. However, the data show that these clusters do not represent positive co-occurrence: these behaviours have formed tight clusters as a result of their *not* being performed by most people. The small distances between these behaviours are in fact indicative of a strong similarity between them on the grounds of their *infrequency*. Examination of the data reveals that other strong clusters, such as behaviours 20-25, have been formed on the same basis: their 'similarity' lies in their *non*-occurrence rather than in their co-occurrence.

Behaviours 1 and 2 form a cluster and the underlying data show that 'using a compost bin/heap' and 'using a bottle/recycling bank' were reported as consistently performed behaviours. Research shows that 'waste watching' is a strong motivation and value system for certain segments of the population (Defra, 2008; Brook Lyndhurst, 2008), so it is perhaps unsurprising that these waste behaviours, that are arguably distinguishable from other, more common waste behaviours, should group together in such a clear way. It is also notable that this is an outlying cluster, located at a relatively large distance from all other behaviours and clusters).

Other separate subsets may be identified from the dendrogram. For example:

- Behaviours 48 to 62 appear to form a group, although the horizontal distance between the behaviours is relatively large. Inspection of the data shows that these individual behaviours have in common a relatively high number of positive responses, which seems to correspond to their relative ease – the cluster includes behaviours such as 'don't overfill the kettle' and 'switch TV off standby'. However, the relatively large (x axis) distance between them suggests that these behaviours, despite all being relatively common, are not strongly associated in the sense of co-occurring in the same respondents.
- Behaviours 33, 34 and 35 ('take fewer flights', 'use a fuel efficient car' and 'high level recycling'). The data suggest that few people performed these behaviours, but amongst those who did, they were often performed together. The proximity of 'high level recycling' (behaviour 35, which includes recycling clothes, shoes and food waste, as well as newspapers and bottles) with these notoriously rare travel behaviours perhaps lends some support to the idea, mentioned in section 2.4, of the green early adopters who started with recycling perhaps stepping up their efforts in a bid to stay ahead of the norm and stay true to their green self identity.
- It is interesting to note the behaviours that are related most weakly to the others. For example, behaviour 66, 'install hot water tank insulation', is at a large distance from all other behaviours,

reflecting the large number of people who reported performing this behaviour and none of the other energy related behaviours.

Analysis of all behaviours and all people shows that, in general, pro-environmental behaviours are not performed consistently among the majority of people. The overall patterns in the data show that as behaviours become more common, their proximity to one another on the x axis decreases and the association between them becomes weaker.

The next section breaks the analysis down into smaller groups of behaviours and people in order to identify underlying patterns within behavioural domains and within segments of the population.

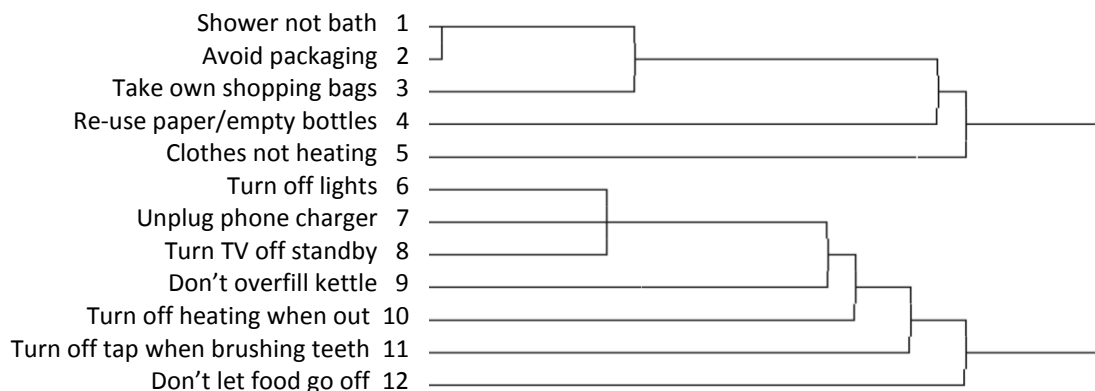
4.3 Specific behaviours

Analysis was performed on specific questions from the survey, which correspond to pre-defined behavioural domains. It is important to note that these domains were built into the survey design based on the judgement of professionals and may not correspond to ‘natural’ domains of behavioural co-occurrence. Below are three examples.³³

4.3.1. Household behaviours (survey question C25)

Within the separate household behaviour dendrogram (figure 4) we identified two clusters of interest: behaviours 1 and 2 (and 3); and behaviours 6 – 8.

Figure 4 Dendrogram of environmental household behaviours (survey question C25)



The clearest cluster contains ‘having a shower rather than a bath’ and ‘avoiding food with excess packaging’, which also links relatively closely to ‘take own shopping bags.’ The data show that the first two behaviours

³³ The way in which the survey was designed and the cluster analysis specified meant that certain examples of the domain specific analysis emerged as more suitable for analysis. The three examples in this section were chosen because they contained enough behaviours to be suitable for analysis (some questions contained only two or three behaviours) and because the responses to the component questions were most suitable to be analysed together. Alternative domains could be analysed by combining different survey questions in different ways; this analysis represents only one of many possible specifications of the data.

received relatively small numbers of positive responses: again their similarity seems to lie in their non-occurrence. The behaviour to which this cluster of non-occurrence relates, 'take own shopping bags', received a higher positive response rate.

The other noticeable coherent sub cluster - behaviours 6-8 - includes turning off lights, TVs and mobile phone chargers. A large number of positive responses and proximity along the x axis suggest that these behaviours do co-occur in a relatively large number of people.

Taking the dendrogram as a whole, there are two main subsets of behaviours, from 1-5 and 6-12. Although these clusters do not reflect strong associations between the individual behaviours (the distance between most behaviours on the x-axis is large), it is interesting to note that the two subsets are clearly separated from each other. Reflecting on Tucker and Douglas (2006) and Barr (2005), the top cluster suggests a relationship between waste prevention behaviours, with 'deciding not to buy something because you feel it has too much packaging', 're-using things like empty bottles, tubs or jars, envelopes or paper' and 'taking your own shopping bag' grouping together.

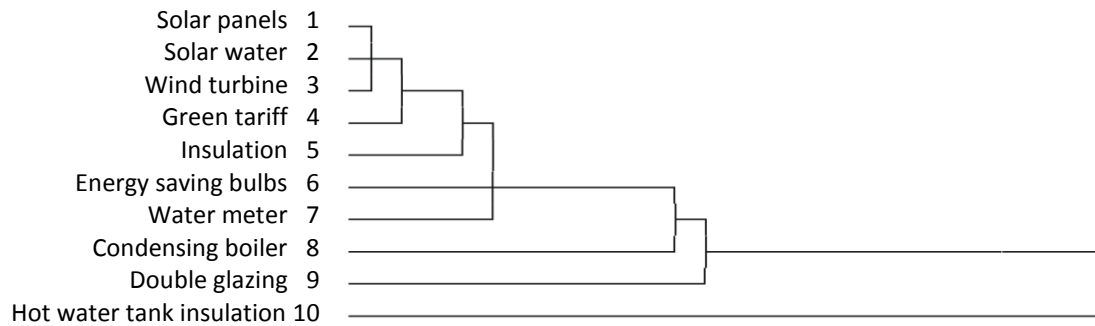
It is interesting to note that 'have a shower rather than a bath' and 'put on more clothes instead of turning up the heating' belong to the waste cluster rather than the energy cluster, perhaps echoing pilot study participants' concern with frugality and avoiding unnecessary waste. Another possible interpretation of the differences between these two clusters is that the lower cost, easier behaviours have tended to cluster together at the bottom of the dendrogram, whereas the top cluster arguably contains behaviours that require more effort.

4.3.2. Energy and water efficiency (section C)

This dendrogram shows that 'hot water tank insulation' is at a large distance from all the other energy behaviours. The data shows that a large number of people reported having hot water tank insulation but doing no other energy saving behaviours. The data show that the second most common response pattern to this question was doing *none* of the energy saving behaviours included in the survey. The smallest number of positive responses related to the microgeneration and green tariff behaviours – again, the cluster from behaviours 1-4 represents a strong pattern on *non*-occurrence. There also appears to be some association (albeit weak, as indicated by the relatively large x-axis distances between them) between behaviours 6 – 9 (using energy saving bulbs, having a water meter, having a condensing boiler and double glazing).

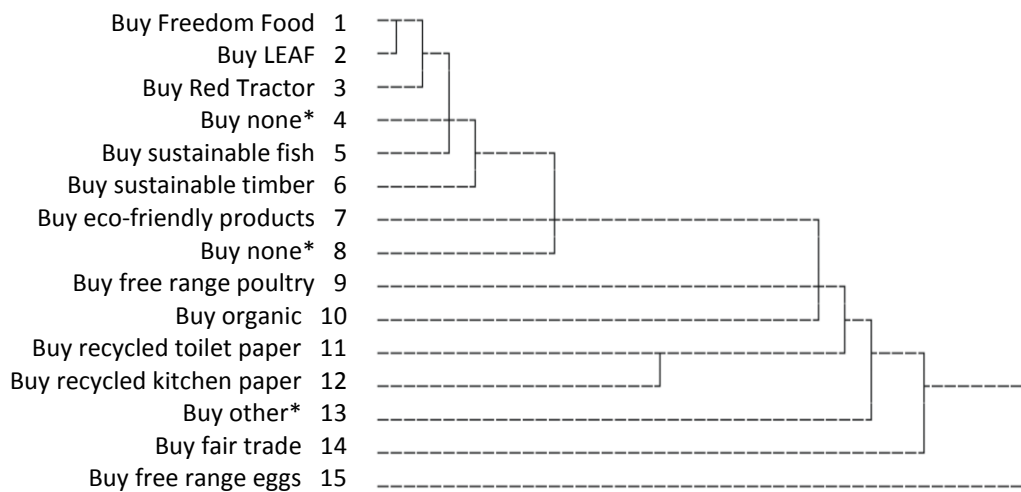
Overall, the dendrogram of energy behaviours shows the strongest associations between behaviours that are *not* performed by large numbers of people and demonstrates generally low uptake of individual or groups of behaviours, with the exception of insulating hot water tanks, which many people reported doing.

Figure 5 Dendrogram of energy and water efficiency measures (entire sample)



4.3.3. Purchasing (questions F5 and F6)

Figure 6 Dendrogram of purchasing behaviours (entire sample; questions F5 and F6)



*All responses analysed, including negative 'buy none' and unspecified 'buy other'.

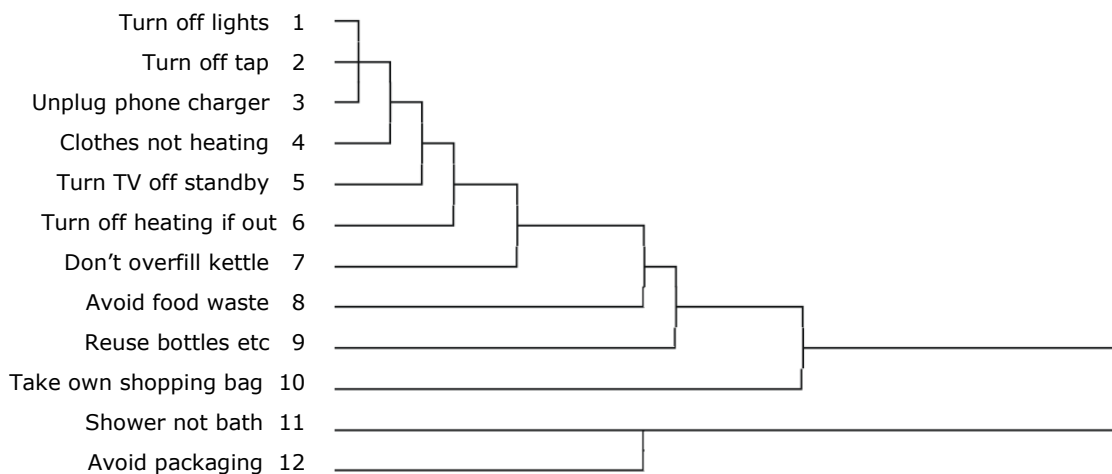
The purchasing behaviours seem to form one undifferentiated group, undivided by clear, separate sub clusters. However, some members of the group are more closely related than others. There appear to be close connections between buying Freedom Food, LEAF, Red Tractor, and sustainable fish products. Examination of the data reveals that, again, the basis of this similarity is their rarity. The data show that 'buy fair trade' and 'buy free range eggs' both received relatively large numbers of positive responses but were not strongly associated with each other or with any other purchasing behaviours.

4.3.4. Differences between Defra segments

Cluster analysis was also performed in the different behavioural domains for each of the Defra segments. Below are the results of the set of household behaviour questions for the Positive Greens, the Waste Watchers and the Honestly Disengaged segments³⁴. Note again that the behaviours have different numbers in each diagram for ease of reference.

Positive Greens

Figure 7 Dendrogram of household behaviours, segment 1 (Positive Greens, question C25)



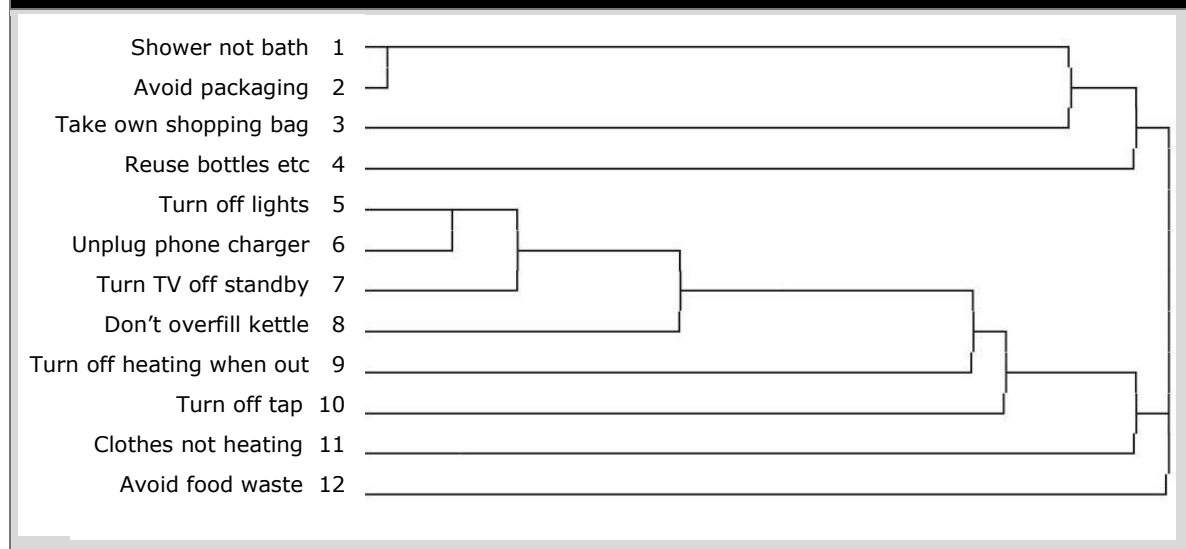
This dendrogram of the Positive Green group's household behaviours shows clear associations of positive, pro-environmental behaviours: for example, behaviours 1-7 received a high number of positive responses and the short distances between them on the x-axis shows they were strongly associated with one another.

This cluster could be treated as a subset of a slightly larger cluster that extends to behaviour 10, which includes waste and waste prevention behaviours, although the associations with these behaviours are weaker. There is a large distance between this main cluster and the remaining two behaviours – 'when there is a choice, have a shower rather than bath' and 'decide not to buy something because you feel it has too much packaging'. The data show that these behaviours are less common and not performed as consistently among this group as the other behaviours.

³⁴ This set of behaviours (question C25) was chosen as it constitutes a single question so minimises inconsistencies in response and coding. These three segments were chosen as having the clearest differences in attitude (see Defra 2008).

Waste Watchers

Figure 8 Dendrogram of household behaviours, segment 2 (Waste Watchers; question C25)



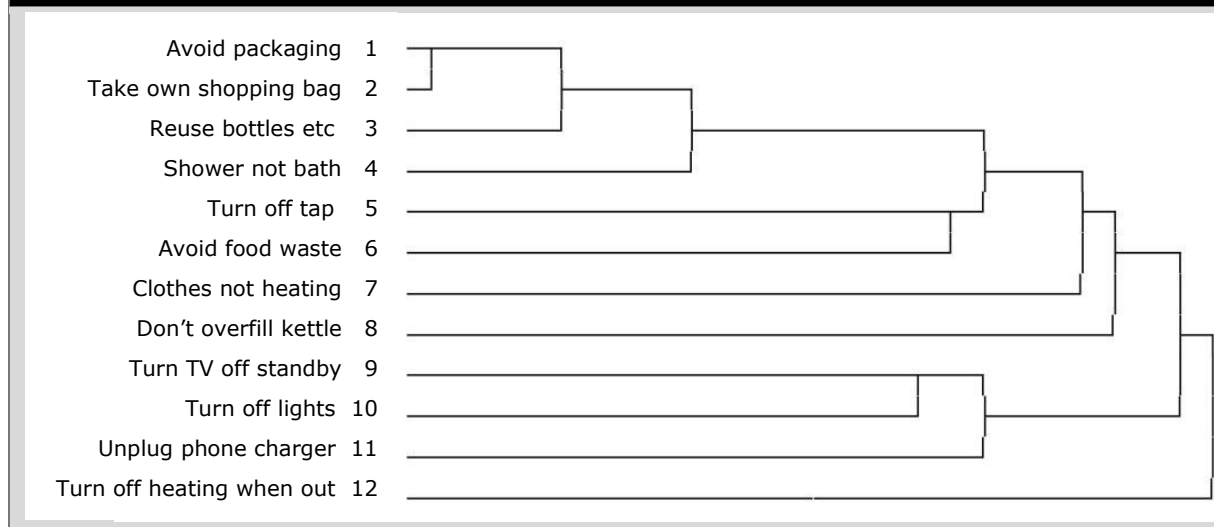
The dendrogram of Waste Watcher responses is different from the diagrams for the other two groups, in that two separate clusters are clearly distinguishable (1-4 and 5-12). The first cluster groups 'having a shower rather than a bath', which may be perceived as avoiding wasting water and/or energy, with other non-food waste prevention activities. The most similar behaviours in this group are 'have a shower rather than a bath' and 'avoid packaging.' 'Take own shopping bag' and 'reuse things like empty bottles'

The other cluster (5-12) contains the energy behaviours, as well as turning off the tap when cleaning teeth. Switching off lights, TVs and mobile phone chargers again form a coherent subgroup.

It is interesting to note the relationship of 'throw food away when it's gone off [never]', which we know to be a behaviour central to the value system of the Waste Watchers (see Defra, 2008; Brook Lyndhurst, 2008). This behaviour had a large amount of positive responses and is linked to both main clusters of behaviours. This suggests that it could be a common or underlying component of both. The shape of the diagram suggests that avoiding food waste was equidistant from both clusters – perhaps falling in between or providing a bridge between the two.

Honestly Disengaged

Figure 9 Dendrogram of household behaviours: segment 7 (Honestly Disengaged; question C25)



The dendrogram of Honestly Disengaged responses does not reveal any clear clusters of consistently performed behaviours, with all behaviours at a large distance from all other behaviours and very small numbers of positive responses for most behaviours. Behaviours 1 - 4 ('avoid packaging' and 'take own shopping bag', 'reuse bottles etc' and 'take a shower rather than a bath) form a clear cluster of non-occurrence. Turning off lights, mobile chargers and TVs received more positive responses but the large distances between behaviours suggests that they were not similar in terms of co-occurrence.

4.3.5. Comments on the differences between segments

In general, the different segments' dendrograms showed few patterns of positive co-occurrence. The strongest clusters are made up of behaviours that most people did *not* practise – these behaviours were similar in their infrequency. However, there are some differences between the three segments studied here. It is interesting to note that, just as the pilot exercise showed that 'greens' employed relatively coherent, well defined constructs, the Positive Green dendrogram above reveals some patterns of positive co-occurrence, notably amongst energy and water saving behaviours:

- Turn off lights when not in room;
- Do not leave tap running;
- Unplug phone charger;
- Put on extra clothes instead of turning heating on or up;
- Turn TV off standby;
- Turn off heating if out;
- Don't overfill kettle.

This contrasts with the Honestly Disengaged group's dendrogram and the non-greens in the pilot exercise; the pilot exercise showed that this group made much weaker associations between the behaviours and this is mirrored in the dendrogram above, which shows that the behaviours did not emerge as 'alike' for this group, except in their non-occurrence.

The Waste Watchers' dendrogram indicates that these respondents made a broad distinction between the waste and energy behaviours included in this question. Avoiding packaging, re-using shopping bags and reusing jars and bottles clustered together; and the energy saving behaviours were in a separate cluster. Energy saving behaviours relating to household appliances formed a notable cluster of 'similar' behaviours among this group ('turn off lights', 'unplug phone charger', turn TV off standby', and 'don't overfill kettle'). Although receiving high numbers of positive responses, there were relatively large distances between waste-related behaviours such as 'avoid packaging' and 'reuse bottles'. This suggests that these behaviours, although individually popular, did not tend to co-occur in the same respondents.

4.4 Overall comments on the cluster analysis

The most striking result of the cluster analysis is that, when all behaviours were analysed across the whole sample, very few coherent clusters of consistently performed behaviours emerged; most of the behaviours are only very weakly related to one another; and the clearest patterns were those of non-occurrence. The clearest patterns of non-occurrence were among less common behaviours that have some external barrier (such as cost) and are associated with 'green' values, such as installing domestic microgeneration, switching to a green energy tariff, participating in carbon offsetting schemes and avoiding flying.

Referring back to the findings of the qualitative pilot study, it is possible that this pattern may reflect the different motivations driving these behaviours (or reasons why people do and do not do them): whereas the less common green behaviours (such as those mentioned above) are unequivocally environmentally motivated, it is likely that many of the other behaviours are underpinned by a mixture of motives and are not seen as specifically environmental. For example, many pilot study participants did not consider waste behaviours as 'green' behaviours or diagnostic of a pro-environmental outlook on life. Similarly, a typical category for switching off electrical appliances was a combination of cost savings, avoiding unnecessary waste and fear of fire. This suggests that, as with the sorting exercise, the set of 'pro-environmental' behaviours as specified by policy makers and experts does not form a natural 'set' based on the motivations of most of the population. It would be interesting to perform a cluster analysis on a wider, more diverse set of behaviours to explore where the 'pro-environmental' behaviours fell naturally among more everyday behaviours.

Analysing the behaviours by Defra segment revealed some differences between the responses of these groups. The Positive Greens reported performing the household behaviours more consistently than the other segments, and qualitative differences can be seen between different groups. A striking example of this is the clear distinction amongst Waste Watchers between waste behaviours and other behaviours.

The aim of this cluster analysis was to explore the co-occurrence of pro-environmental behaviours among a larger, more representative sample of the public, in order to provide another dimension of analysis to our study of spillover and catalyst behaviours. Since co-occurrence may be an indication of a catalyst relationship between behaviours, we wanted to explore the incidence of consistently performed groups of behaviours across a wide range of actions and a representative group of people.

The analysis showed that most behaviours had low uptake and there was little association between them. This suggests that, at the highest level, including all of the behaviours in the survey and the entire sample, co-occurrence of behaviours was hard to find. The strongest patterns of co-occurrence were found among the Positive Green group, and no clear patterns of co-occurrence were found among the Honestly Disengaged group. The most consistently performed behaviours were the greenest behaviours, which reference to the data underlying the dendograms shows were performed most infrequently. Breaking the sample down into the Defra segments, again behaviours emerged as more 'alike' among the greener participants and clearer groupings according to 'behaviour type' were observable for these people.

Since co-occurrence of behaviours provides a possible clue about an underlying causal relationship between the behaviours that are observed to co-occur, this cluster analysis was performed in order to identify the strongest patterns of correlation (although note that this type of analysis cannot tell us anything about the order or process of uptake of co-occurring behaviours). The strongest patterns of positive co-occurrence were observed among the Positive Green group, and the most inconsistent behaviour was found amongst the Honestly Disengaged group. However, the most striking indication of the analysis is that most of the behaviours included in the survey are not performed consistently by the majority of people.

4.5 Limitations and areas for future development

This cluster analysis is subject to a number of limitations, including:

Data

- Some parts of the survey were not ideally suited to this type of analysis. For example, in section B, Travel Behaviour, respondents were required to select the *single* mode of transport they used most (question B6). Selecting a single mode rendered it impossible to explore co-occurrence of different types of travel behaviour.
- A related limitation is that the large dendogram of all behaviours (figure 4) combines various different questions and question types. For this reason, it should be treated with caution, as some questions are more compatible for co-analysis than others.
- Again to make analysis more manageable, some questions with multiple response options were combined into a single variable. For example, the detail of different types of recycling behaviours (section E) were combined into a single variable for inclusion in the large dendogram. Further analysis could separate these combined variables into their component parts for re-analysis at a finer level of detail.

Domain specifications

In order to overcome some of the difficulties of combining all questions and variables, we split the analysis up according to different behavioural domains. The domains we chose to analyse corresponded to different survey questions. The analysis could be repeated with alternative domain specifications and different

combinations of behaviours. For example, we analysed section C, Energy and Water Efficiency, in two parts in order to make results more accessible. An alternative approach could combine these into a larger analysis.

It may be possible to improve our domain specification by referring to respondents' actual behaviour patterns or conceptualisations. In other words, we could analyse domains based on the findings of pilot exercise by re-combining variables based on participants' conceptualisations. This would provide an alternative to using the survey questions (and the domains they refer to such as 'energy' or 'travel' behaviours) as the basis for analysis and may give rise to new and different clusters.

5 Summary and discussion

This section addresses our original research questions and explores what the sum of the research evidence set out in this report can tell us about catalyst behaviours.

5.1 Is there plausible evidence for catalyst behaviours?

The desk based review revealed little substantive evidence of direct causal ('catalyst') relationships between different pro-environmental behaviours. We found little evidence in support of the suggestion that there are certain 'trigger' behaviours that cause individuals to then take up further 'outcome' behaviours. However, it did uncover some evidence of behavioural spillover in a more general sense of certain events, situations or states resulting in the uptake of multiple behaviours.

The evidence also indicates that pro-environmental behaviours often co-occur, indicating the possibility of some kind of direct or indirect relationship between behaviours. The sum of the evidence suggests that there may be various different ways in which pro-environmental behaviours are related to one another and could potentially influence one another in different contexts. This implies that there may be various different routes by which spillover (both in the general sense and the catalyst behaviour sense) can occur.

5.1.1. Practitioner evidence

The multidimensional nature of the relationships between different behaviours was underscored by the 20 practitioners interviewed as part of the evidence review. The practitioners took a very broad view of the catalyst process and referred to behaviour change being catalysed by information, knowledge, 'awareness' or social context, rather than particular behaviours triggering the process. In other words, the practitioners' understanding of 'catalysts' included the wider context of behaviour change and spillover in a more general sense, rather than just the specific process of a particular behaviour leading to other behaviours.

The idea of spillover and catalyst behaviours resonated strongly among the practitioners, although spillover triggered specifically by catalyst behaviours was only a subset of the wider field of general spillover effects. Focusing on spillover triggered specifically by participation in *behaviours*, a number of different *types* of catalyst effect were mentioned by practitioners:

- new pro-environmental behaviours that result in the uptake of other, different pro-environmental behaviours (e.g. NEA, 2008; Global Action Plan);
- new behaviours 'spinning off' from existing behaviours, sometimes described by participants as "the next natural step" (e.g. Tucker and Douglas, 2007; Garden Organic);
- 'feedback mechanism', whereby participation in a new behaviour boosts participation in an existing behaviour (e.g. Open University and IPSOS-MORI; Somerset County council);
- situational (e.g. work/school to home) and inter-personal spillover (Envision; SOLAR);
- negative spillover, where participation in a behaviour blocks participation in further behaviours, sometimes by giving people an 'alibi' or excuse not to take up more difficult or costly actions (see section 2.5.3).

Even within this broader definition of catalyst based behaviour change, however, there was little concrete evidence available to support the widespread belief that catalyst effects do occur. Most evidence was anecdotal and very few projects had incorporated robust measurement techniques into their methodologies. Additionally, much of the practitioner evidence was based on small, sometimes biased samples that make it difficult to draw firm conclusions about the effects of the behaviours themselves. For example, NEA (2008) reports spillover effects of energy and water interventions; however, it is difficult to isolate the *cause* of these spillover effects, which could have been the behaviours themselves, but also may have been the type of intervention used or the self selecting sample which was perhaps pre-disposed to take up multiple behaviours.

The lack of measured, replicable evidence of catalyst behaviours, or indeed any of the wider forms of spillover that were broadly categorised by practitioners as ‘catalyst based change’, can be interpreted in two different ways:

- It is possible that methodological difficulties have prevented accurate isolation and measurement of spillover effects, perhaps because the process is highly context specific and holding enough variables constant to be able to observe spillover is difficult.
- Another interpretation of the lack of evidence is that the widespread belief in catalyst behaviours constitutes an attribution error: behaviour change is observed and post-rationalised as resulting from a catalyst behaviour type process, whereas in reality, some other, underlying causal factor was at work.

In the absence of experimental research evidence and robust project evaluation data, it is difficult to evaluate whether methodological problems or a fundamental attribution error lie at the root of the formal evidence gap around spillover. However, the anecdotal and circumstantial evidence show that in practitioner circles the idea has considerable intuitive appeal and provides a useful basis for designing behaviour change projects. In sum, despite the lack of formal testing of the ideas, the anecdotal and circumstantial evidence seem to suggest that spillover does occur. However, further research and formal testing would be required to establish whether the appearance of spillover is grounded in reality. In practical terms, this would require methods for capturing data on spillover to be built into projects from the outset.

We next turned to the academic and grey literature to investigate whether there was any formal support for the ideas around spillover that had emerged from the practitioner evidence.

5.1.2. Evidence from the literature

Wider literature

The review of academic and grey literature included a search for evidence of spillover and catalyst behaviours in a number of fields, including psychology, sociology, economics, health and marketing. We found examples of spillover in the wider sense in all these areas, and a limited number of examples of spillover triggered by catalyst behaviours. A selection of examples is shown below:

Table 11 Examples of spillover from the wider literature	
Discipline	Example
Psychology	The spillover from one situation to another of attitudes and beliefs such as optimism and pessimism (Dickinson and Oxoby, 2007) and moral outrage (Mullen and Nadler, 2008). These attitudes and beliefs that were induced in one situation were demonstrated to have measurable behavioural effects in different, unrelated situations.
Sociology	Patterns of behaviour, attitudes and skills learned at work have often been demonstrated to spill over to home life and leisure time (Kremer and Harpaz, 1982; Kirchmeyer, 1992; Wilson and Musick, 1997).
Marketing	The techniques of brand alliances and brand extensions are designed to encourage positive attitudes (and therefore purchasing behaviours) towards one product to spill over to other, related products (e.g. Simonin and Ruth, 1998, 2000; Shine et al, 2007). Brand alliances and extensions involve co-marketing a new product with an established, successful 'parent' product. This literature emphasises the importance of 'product fit' and ensuring not only that the relationships between co-marketed products are clear to the potential consumer, but also that the <i>right agency</i> is sending the message (Aaker and Keller, 1990). One particular type of brand extension is known as completing the set, which plays on consumers' desire to behave consistently towards a brand. For example, if an individual has a Kodak camera, by marketing other related products as a coherent set, the consumer is encouraged to 'collect' co-marketed accessories such as the Kodak photograph printer, the Kodak paper and so on (Shine et al, 2007).
Health	One study (Ross and Thow, 1997) showed that participating in exercise can be a catalyst for a healthier lifestyle among cardiac rehabilitation patients. It has been proposed that the act of taking soft 'gateway drugs' may cause some people to move on to harder drug abuse (see below).
Economics	Hertwich (2005) investigates negative spillover (rebound) effects of energy efficiency measures – as energy production becomes more efficient, demand for energy increases due to the decreased price. He suggests several mechanisms of spillover at the household level as a result of changes in energy policy. One example is the income effect: an increase in disposable income as a result of decreasing energy costs leads to the purchase of other products, which may include more energy-using equipment on one hand, or on the other more positive hand, reallocating the spare income to buy environmentally friendly products such as organic food.

A topic that has received much attention in the health arena is the question of 'gateway drugs' - the idea that taking certain kinds of 'soft' drug (e.g. cannabis) can lead on to more serious substance abuse (e.g. cocaine and heroin) (e.g. Kandel and Yamaguchi, 1994). This issue provides a particularly close parallel (albeit with negative or anti-social behaviours) to our question of pro-environmental catalyst behaviours. Soft drug taking and hard drug taking are frequently observed to co-occur, and often in a temporal order from soft to

hard, implying some kind of causal relationship. However, research has shown that this apparent causal path from one behaviour to the other is largely an illusion: other latent variables are generally the most important cause of both types of drug taking. Although some gateway effects exist for some people, the paths are generally highly contextual and tied in so closely to each individual's personal circumstances, that it is almost impossible to disentangle the gateway effect from the 'contextual noise' (Pudney, 2002; Rose, personal communication, 2009).

Pro-environmental behaviour change literature

Turning to the pro-environmental behaviour change literature, the patchy nature of the practitioner evidence is mirrored in the academic literature, where only a handful of authors have produced research around pro-environmental behaviour spillover effects and even fewer have produced any experimental evidence designed to test spillover hypotheses.

The academic research into spillover of pro-environmental behaviours falls into one of two categories. The first is research that sets out specifically to test hypotheses related to the question of spillover (Thøgersen, 2004; 1999; Thøgersen and Ölander, 2003; 2006; Kaiser and Wilson, 2004; Kaiser, Byrka and Hartig, 2008; Byrka, Kaiser and Hubner, forthcoming). This research is mainly based on survey data, with correlations between behaviours analysed using statistical tools designed to isolate the effects of earlier behaviours on later behaviours.

Thøgersen and colleagues' experimental research finds spillover effects between pro-environmental behaviours to be weak and not to occur in all possible instances. They also find some negative effects, whereby participation in some behaviours (for example, recycling) is negatively correlated with participation in other behaviours (for example, waste prevention behaviours). Thøgersen and colleagues take a 'psychological' approach to the concept of spillover, investigating how the antecedents of behaviour are affected by participation in particular behaviours.

In contrast, Kaiser and colleagues take a 'structural' approach to spillover. They define spillover as being dependent on structural relationships between behaviours. This definition does not focus on causal paths between behaviours, but rather treats them as being in reciprocal relationships with each other. Within this framework, Byrka, Kaiser and Hubner (forthcoming) seem to have more success in observing wide ranging pro-environmental behavioural spillover. In their latest work, the effects of previous behaviours on subsequent behaviours may be overshadowed by other likely causal factors underlying their experimental outcomes, not least a self selecting sample and face to face persuasion techniques. This again suggests that the wider context of spillover is at least as, if not more, important than the relationships between the behaviours themselves.

The second category of academic spillover research contains a slightly greater number of authors who have observed temporal correlations between behaviours and suggested that this may be indicative of a spillover effect (e.g. on waste: Tucker and Douglas, 2006; Berger, 1997, Barr, 2005; 2007; on microgeneration: Open University/EST, 2008; Dobbyn and Thomas, 2005). These papers provide further evidence that certain pro-environmental behaviours tend to co-occur; they do not prove a catalyst relationship between behaviours, but arguably provide some circumstantial evidence in support of the spillover hypothesis.

Academic researchers have suggested that spillover research is particularly prone to a type 2 error (a false negative result) due to measurement error and methodological difficulties stemming from contextual noise (Thøgersen, 2004; Byrka et al, forthcoming). Thøgersen (2004) does find evidence that spillover effects can be suppressed by measurement error. However, as with the practitioner evidence, the absence of an established body of evidence that has been extensively tested, retested and verified, makes it difficult to assess whether the problems are methodological or again down to an attribution error.

Overall, the evidence for catalyst behaviours is mixed. The sum of evidence from the fields reviewed suggests that spillover, in the sense of outcomes above and beyond the scope of an intervention, does occur. However, using the term 'spillover' or 'catalyst behaviour' is deceptively simplistic, since these terms actually refer to a group of processes or mechanisms that can result in the uptake of multiple behaviours.

The evidence indicates that spillover can occur at many levels and in many different ways, including at the levels of attitudes and beliefs, skills and behaviours. However, these processes are highly context specific and there may often be too much 'noise' to observe or measure them accurately. It also seems that the idea of catalyst behaviours is often subject to a fallacy of attribution. Correlation can easily be mistaken for causality; as with the 'gateway drug' theory, there is a danger that certain types of behaviour change may be post-rationalised as spillover from one behaviour to other behaviours, when in fact an underlying, often invisible variable constituted a common cause.

There is very limited evidence about spillover of pro-environmental behaviours catalysed by *actions* (e.g. 'switching off lights' or 'taking your own bag shopping' leading to a wider range of sustainable behaviours). Where catalyst behaviour effects are found, they are demonstrated to be weak and often obscured by contextual noise. Other studies that seem to provide circumstantial evidence for catalyst behaviours may be in danger of falling into the same fallacy of attribution as the 'gateway drug' argument in the field of health: although behaviours are observed to co-occur in a linear temporal order, they may both (all) in fact be products of common underlying variables. Rather than a causal relationship between the behaviours themselves, both behaviours may in fact be outcomes of underlying drivers. This illustrates the importance of considering behaviour patterns in the context of internal (values, attitudes and so on) and external (social and circumstantial) conditions in order to build up a full picture of the causes and consequences of different actions (see section 5.4 below for discussion of how the probability of spillover occurring may be increased).

5.1.3. Evidence from the pilot exercise and cluster analysis

The pilot exercise and the cluster analysis together provide a picture of *which* pro-environmental behaviours co-occur and *why* these patterns occur – in particular, the relationships that are perceived to exist between them. This cannot tell us about the process of spillover, but it provides a foundation for understanding the nature of the relationships between pro-environmental behaviours, both at the practical and conceptual levels.

The findings of the pilot exercise may shed some light on why spillover and catalyst behaviours, particularly in the environmental arena, are so difficult to pin down. Firstly, the pilot exercise showed that participants did not have well established environmental behavioural categories, but thought about the behaviours on an ad hoc basis, without reference to a fixed conceptual framework. This poses a potential problem for many of the suggested mechanisms of catalyst behaviours, which generally assume or rely on some kind of structural relationship or perceived similarity between the behaviours.

Secondly, the constructs participants used to categorise the ‘pro-environmental’ behaviours were generally a multifaceted combinations of factors – rather than using simple, abstract constructs, people generally constructed complex categories that involved various aspects of their lives, attitudes and affective (emotional) reactions. This again causes a problem for many of the suggested theoretical explanations of behavioural spillover, but also points to another fundamental difficulty with studying spillover effects among pro-environmental behaviours. It seems that ‘environment’ was not a construct that was commonly used by participants to categorise the behaviours and when it was used, it was frequently used in conjunction with other, non-environmental constructs such as ‘saving money.’

This suggests that, for most groups of people, it may be unrealistic to expect spillover to occur between (what ‘experts’ commonly categorise as) ‘pro-environmental’ behaviours. The expert categorisation of the behaviours as ‘pro-environmental’ does not match most participants’ categorisation, which was based mainly on other, non-environmental constructs. Put simply, an expert perspective of the pro-environmental behaviours did not resonate with the participants’ way of understanding the world. In the absence of ‘environment’ as a common denominator or link between behaviours, spillover along a pro-environmental dimension is unlikely to occur and interventions designed to promote spillover on the basis of environmental constructs are unlikely to work. Spillover may indeed occur, but in the absence of a similarity relationship of ‘pro-environmental’, that spillover may be along any of the other ‘similarities’ that link those behaviours.

Finally, and related to this, when participants were asked about why they did and did not do the behaviours in the set, it was striking that most gave highly personal, contextual reasons for their behaviours. For example, one participant expressed a very positive attitude towards growing her own fruit and vegetables on the balcony of her flat and had even borrowed books from the library on the subject. However, her efforts had been thwarted by her cat, which got into the pots on the balcony and dug up all the soil so that the downstairs neighbours complained about soil falling onto their balcony. Such specific and personal reasons such as this for why people did and did not participate in the behaviours suggest that even if the behaviours were all perceived to belong to a coherent set of pro-environmental action, underpinned by a common goal and a strong set of values, spillover still might be suppressed by the inevitable ‘idiosyncratic conditions’ (Thøgersen, 2004) around different behaviours for different people in different situations.

5.1.4. Overall comments

One of the most striking observations to emerge from the evidence review and interviews with practitioners is the gap between the widespread belief that catalyst behaviour processes do exist and the actual evidence available in support of this. The idea of catalyst behaviours is often appealing to those interested in promoting or encouraging more sustainable lifestyles: the idea of a self-sustaining chain reaction of positive behaviours or positive outcomes over and above the scope of an intervention, in its best case scenario represents a potential ‘multiplier effect’ of benefits from relatively small scale inputs.

The evidence review shows that the idea of catalyst behaviours is not supported by a coherent, robust evidence base. There is, however, a significant amount of anecdotal evidence, as well as a small amount of more robust evidence, relating to a group of ideas and theories that are loosely referred to by those working in the field as ‘spillover.’ It seems that the simple equation of *behaviour a* → *behaviours b + c* is not supported by the evidence, but a wider, less narrow perspective on spillover is.

It is telling that there is almost no practitioner evidence that focuses solely on catalyst behaviours or spillover processes. Instead, it is treated as part of a much wider and more complex process of behaviour change. Similarly, the academic evidence suggests that spillover effects from one behaviour to other behaviours can explain only a very small part of the variance in behavioural correlations, and, moreover, that these effects are often completely suppressed by idiosyncratic, ‘real life’ variables.

The sum of the evidence therefore suggests the following hypothesis: spillover can and does occur and is sometimes triggered by participation in actions (although it can also be triggered in many different ways, for example through group learning, awareness raising or by influential individuals). However, the spillover ‘journey’, or the path that leads from one behaviour to another or other behaviours, is likely to be highly context specific and surrounded by idiosyncratic conditions at the levels of the behaviour, the individual and the social context. The probability of spillover occurring is therefore a function of both personal attributes and the wider social and situational context. The highly contextual nature of spillover processes, along with the finding of the pilot exercise that ‘environment’ is not a core or established construct used in every day decision making, may help to explain why spillover is so difficult to predict, observe and measure.

5.2 If it is observed, how does the process work?

The review of the existing evidence has suggested that taking up one pro-environmental behaviour can play a part in causing the uptake of other behaviours, but generally only as one part of a wider behaviour change context: any one ‘trigger’ behaviour is not sufficient on its own to cause wider behaviour change. This view is supported by a review of the processes or mechanisms that are suggested in the literature and by practitioners to explain spillover: it seems that trying to isolate a single catalyst process is a red herring, since there are a number of different ways in which participating in a behaviour can result in the uptake of more behaviours.

There are several social-psychological processes that may have particular relevance in explaining how and why participation in a behaviour or behaviours can result in more generalised behaviour change. The table below includes both rational models of behaviour change and the less deliberative, sometimes unconscious mechanisms that may help explain this particular type of behaviour and behaviour change.

Table 12 Some possible explanations of the spillover process	
Theory type	Details
Consistency	<p>Cognitive dissonance (Festinger, 1957) – the feeling of discomfort relating to conflicting attitudes, beliefs, actions. Behaviour may change to neutralise dissonance: other pro-environmental behaviours may be adopted to neutralise dissonance, although alternatively the pro-environmental behaviour causing the dissonance may also be abandoned. Note that dissonance only occurs between behaviours that are perceived to be related. Balance theory (Heider, 1946) also based on people’s desire for consistency, is often applied to consumer behaviour/marketing. This again depends on related behaviours.</p> <p>Consistency theories also interact with ‘commitment to a goal’ techniques such as foot in the door. These techniques rely on general striving for consistency (manifested, for example, in not wanting to waste the effort one has put in so far) to move people through sequences of increasingly difficult or costly behaviours.</p>

Self identity	<p>Self perception (Bem, 1972) – the theory that we infer our own attitudes from observing our own behaviour, especially in ambiguous situations or in the absence of a well established personal norm. Performing a behaviour leads to the inference that “I am the sort of person who...” and in conjunction with dissonance theory/general striving for consistency, behaviour may change. This may cause the individual to align their cognitions (beliefs, attitudes, values and self image) with the behaviour they observe themselves performing – “If I’m willing to recycle and switch my appliances off standby, I must have a pro-environmental attitude”. Self identifying as pro-environmental may provide the basis for further behaviour change to reduce dissonance between the pro-environmental attitude and other un-environmental behaviours.</p> <p>Strongly linked to the theory of self perception is the idea of self identity/self concept; people coming to see themselves as ‘green’ is found to be an important antecedent of behaviour in the literature and was often mentioned during interviews with practitioners</p>
Self efficacy	<p>(Bandura, 1977) – the belief in one’s ability to succeed in specific situations can have a direct effect on behavioural choices. People are more likely to engage in behaviours that they think they can do, and may have stronger motivations to perform a behaviour and persist in doing that behaviour, whereas low self efficacy can be a psychological barrier by making tasks seem more difficult than they actually are.</p> <p>Bandura singles out personal experience of a behaviour as the most important factor determining an individual’s self efficacy in relation to that behaviour. It seems plausible that increased self efficacy in relation to one behaviour may spill over to other related behaviours – “If I can do behaviour A, then I’ll probably be able to do behaviour B too.”</p>
Norm activation theory	<p>(Schwartz, 1977) – altruistic behaviour triggered by personal norms that are activated by awareness of consequences and ascription of responsibility to self. Ascription of responsibility to self depends on self efficacy, which can be encouraged through action; cognitive dissonance/self perception could provide the basis for spillover or extension of the personal moral norm to related behaviours.</p>
Theory of planned behaviour	<p>(Ajzen, 1985) proposes that attitude, perceived social norm and perceived behavioural control (i.e. the extent to which I think I am able to perform that action with regards to both internal and external conditions) feed into behavioural intention, which, under the right external conditions, leads to action. It is possible that performing an action may increase perceived behavioural control and increase the salience of others’ similar actions (i.e. the perceived social norm). Dissonance theory also explains how an attitude may change to fit with a new behaviour and it has been shown that attitudes based on personal experience are stronger and more salient than attitudes that are not (Fazio, 1986).</p>
Habitual behaviours	<p>This literature suggests that the deliberative process described by the theory of planned behaviour and assumed by other psychological models can be bypassed and attitudes and behaviours can be automatically activated by situational cues (e.g. Aarts and Verplanken, 1998; Klockner and Matties, 2004).</p>

	<p>Habits and other pre-conscious/automatic elements of behaviour are sometimes thought to block spillover (e.g. Thøgersen and Ölander, 2003; Klockner and Matties, 2004) by bypassing the deliberative processes of behavioural decision making. However, as the marketing profession is well aware, pre-conscious processing may also represent an inroad into behavioural choices. For example, highlighting the environmental friendliness of an existing habit may increase the likelihood of individuals coming to see themselves as ‘green’, or ‘the sort of person who makes green choices’. Cornelissen et al (2008) call this ‘positive cueing’ of behaviours in order to make them more diagnostic of pro-environmental attitudes and self image.</p>
Spreading activation theory	<p>(Collins and Loftus, 1975) – linked to ideas about habits, Fazio’s (1986) hypothesis states that attitudes based on direct experience are stronger (more easily retrievable or accessible) and more predictive of behaviour than attitudes that are not. Building on this, spreading activation theory has been used (particularly in marketing research) to hypothesise that when experience causes an attitude to become more salient, other attitudes and beliefs that are associated with the catalyst attitude are also brought to the fore through an unconscious process of ‘spreading activation’ of attitudes. This may then provide the platform for further behaviour change based on an underlying attitude.</p>
Learning models	<p>Thøgersen (1999) suggests that behavioural spillover may occur as a result of a ‘learning by doing’ mechanism. By helping an individual to gain skills and know-how, participating in a behaviour may reduce the cost or difficulty of performing new, similar behaviours.</p> <p>Where acquired skills, knowledge or ‘know-how’ are hypothesised to be important, they are often found to be a necessary but not sufficient condition for the adoption of further behaviours. Added to the new skills must be a mixture of variables that account for one’s ‘taste’ for adopting the new behaviour (Wilson and Musick, 1997; see also Velicer et al, 1998, on the transtheoretical model and the stages of change): the new skills and a certain existing ‘state of readiness’ (perhaps comprising existing beliefs and values) must come together to create sufficient conditions for the catalyst effect.</p>
Values-beliefs-norms model	<p>According to Stern (2000), different behaviours are predicted by different combinations of norms, values and beliefs. A high association is often found between pro-environmental behaviours and a value set that includes the ‘big picture’ - variously called universalism (Dietz et al, 2005; Thøgersen, 2003); self transcendent values (Stern, 2003); and altruism (Schwartz, 1977; Dietz et al, 2005). Just as values, mediated by norms and beliefs, influence behaviour, it is possible to speculate that performing a new behaviour may also affect norms, beliefs and values. The altered values may then lead to more general behaviour change, perhaps through a consistency mechanism.</p>

There is very little evidence that formally tests these processes to show that they can explain spillover, with the exception of cognitive dissonance (e.g. Thøgersen, 2004; Dickinson and Oxoby, 2007). They are mostly simply suggestions that seem on the surface to fit in with existing observational data and anecdotal evidence. However, the fact that we can postulate so many different explanations of how spillover occurs provides further support for the suggestion that conceptualising catalyst behaviours as a single process is

problematic. In fact, it seems that we are dealing with a *set of processes* that can explain how participation in a behaviour might (under the right conditions) lead on to other behaviours. It is not a single process, but a group of explanations for how behaviour change can happen, that have common roots in *participation in a behaviour*.

This suggests that the process is likely to be different for different people at different times in relation to different behaviours. This makes it extremely difficult to predict the outcomes of spillover and how wide the effects may be. It may be preferable to concentrate on the enabling conditions that are likely to maximise the probability of spillover (see section 6.4 for further discussion), rather than trying to ‘micro-manage’ such an unpredictable, multidimensional, complex process.

Regarding how and why spillover happens, the practitioners at the expert workshop suggested that the mechanism is often very simple and pragmatic; for example, the realisation that an energy saving measure has saved them money may inspire some people to try other energy saving measure in order to further reduce their bill. This suggests that the psychological processes outlined above can work on a number of different bases or motivations. For example, the rewards for consistency needn’t be simply psychological (e.g. a reduction in dissonance) but can also be practical (e.g. monetary).

Reference to the findings of the pilot exercise may also help us to understand why these processes often provide incomplete explanations of behaviour (e.g. Thøgersen, 2004). As well as the processes being highly context specific and difficult to generalise, we have seen that the behaviours themselves are not generally categorised as simply ‘environmental’. This may be why individuals often do not perceive their own behaviour to be inconsistent: the construct ‘environment’ is not dominant enough to function as a basis for inconsistency.

Overall, examination of the evidence on the existence of catalyst behaviours and the processes that might explain it indicates that:

- catalyst effects do occur, in the wider sense that behavioural chain reactions can be triggered in a variety of ways, including by participation in behaviours;
- catalyst effects are extremely difficult to observe and even trickier to measure, given their highly contextual, non-generalisable nature;
- the ‘catalyst effect’ is not a single process, but a set of behaviour change processes;
- individual ‘catalyst’ behaviours are not sufficient for behaviour change but must be taken as part of a wider context.

5.3 Do catalyst effects occur generally?

Having ascertained that catalyst behaviours are not based on a single process, but on a number of different, sometimes overlapping processes, we can now go on to think about how these different processes might work differently for different types of people and different kinds of behaviour. Do catalyst behaviours occur generally, or do they occur for some very specific behaviours, or audiences, in very specific settings?

5.3.1. How does the process differ across different individuals?

There is a significant gap in the evidence base for work that systematically explores this question, although some specific aspects of it have been considered (e.g. Thøgersen (2004) looks at how different personal norms affect the likelihood of spillover). Other research on behaviour change has looked extensively at differences between groups of people, including the link between attitudes, values, and pro-environmental behaviour. Again, this literature – together with our pilot fieldwork – can be used to surmise how spillover processes might differ according to different ‘sets’ of values held by different types of individual.

All the processes identified as possible explanations of spillover take place within the context of the internal psychological conditions of the individual. The behaviour change literature in general stresses the importance of values in the make-up of these internal psychological conditions and therefore in understanding and predicting behaviour and behaviour change (e.g. Stern, 2000; Ajzen 1985). A recurring theme in the general literature is the strong correlation between ‘bigger picture’ values or worldviews such as universalism³⁵ with pro-environmental behavioural tendencies. This applies equally to the set of behaviour change processes that may be identified as catalyst based behaviour change and the literature provides some specific evidence for this. For example, Thøgersen (2004) demonstrated that personal moral norms have crucial importance for spillover based on cognitive dissonance.

Given that values are shown in the literature to be an important determinant of behavioural outcomes, it is likely that the different processes of behaviour change identified in the previous section will work differently for people with different sets of values. Take, for example, the consistency theory of cognitive dissonance. The literature demonstrates that the dissonance caused by inconsistency increases with the importance of the subject to the individual. This implies that, within in the spectrum of Defra’s segmentation model, Positive Green individuals are likely to suffer much stronger dissonance as a result of inconsistency among their environmental attitudes and behaviours than, for example, honestly disengaged individuals. This suggests that interventions designed to cause and leverage dissonance are likely to be more effective among those with stronger pro-environmental values. The same is likely to apply to interventions that aim to cause changes in self identity or self concept – that is, interventions that encourage people to see themselves as ‘green’ – as the basis for spillover.

A similar case can be made for the importance of values for the learning by doing model. As highlighted above, skills, knowledge and know-how may be necessary conditions for the uptake of a behaviour, but they are not sufficient. Added to the mix must be a ‘state of readiness’ or a taste for not only learning, but then applying the new knowledge and skills to other tasks (see, e.g. Velicer et al, 1998). It is likely that a person’s values may have a direct effect on this state of readiness, which may comprise attitudes, norms and beliefs (Stern, 2000).

The above examples illustrate the importance of values in the behaviour change processes that are implicated in spillover. They assume values to be part of the internal enabling conditions that provide the context for behaviour change. It may also be the case that values can play a more direct role in the spillover process. As the literature suggests, values are a key determinant of behaviour and so a change in values is likely to lead to a change in behaviour (in the absence of external barriers). It is possible to speculate that participating in particular behaviours may eventually lead to a change in values, which would then provide

³⁵ That is, the view that there are universal values and ethical principles relating to such topics as the human-environment relationship.

the platform for more generalised behaviour change. Although values are deeply embedded and difficult to change, it is possible that the path from values to behaviour is a two way street, with each influencing the other. However, the evidence is not clear on how different behaviours and value sets may interact; it is likely that the behaviours that trigger changes in values (if this does indeed occur) will be different for different types of people (see section 5.3.2 for further discussion of the different types of behaviours that may trigger change).

Related to this last point is the values modes model that may also be applied to behaviour change (see e.g. Rose, 2009). This segmentation model, which categorises people into 12 psychographic types, suggests that there are periods of transition between values modes during which individuals are particularly responsive to change and to new 'big ideas'. Research based on this framework (e.g. Rose et al, 2007) has suggested that individuals making the transition from 'immediate picture' (thinking about immediate needs and taking cues from those external to them) to 'bigger picture' values (thinking about more distal needs, such as the needs of others or of future generations and taking cues from an internal moral framework) are often particularly open to adopting new attitudes that reflect a greater sense of universalism. This suggests that individuals in moments of transition or change might be those for whom participating in pro-environmental behaviours may lead to fundamental shifts in values, thereby creating a platform for further, volitional pro-environmental behaviour change.³⁶

The pilot fieldwork exercise and the cluster analysis conducted as part of this research may also shed some light on the type of person for whom the mechanisms of spillover are most likely to find traction. The pilot exercise showed that the 'green' group within the sample used more coherent, well defined categories to think about and understand pro-environmental behaviours than the 'non-green' group. If spillover relies on the existence of (perceived) relationships between the behaviours, and if pro-environmental values are important for 'green' behaviour, it seems likely that spillover will occur more readily for those with stronger pro-environmental values, since pro-environmental values seem to be associated with the perception of stronger links between the behaviours. Further research would be needed to verify this suggestion.

Similarly, the exploratory cluster analysis shows that the strongest, clearest clusters (i.e. the most consistent behaviour patterns) occurs among the 'committed green' behaviours (see section 4.1), which suggests that those individuals who participate in these committed green behaviours are most likely to behave consistently with regard to the common denominator of environmental concern and protection. The cluster analysis further shows that the co-occurrence of behaviours differs markedly between Defra's segments which is also suggestive of different behavioural 'sets' for individuals with different values. The correlation of pro-environmental values and consistent behaviour again suggests that those individuals with a strong set of pro-environmental values are likely to be those for whom the self sustaining 'behavioural chain reaction' idea is most realistic.

Overall, there has been almost no research conducted into the interactions of different sets of values and spillover processes. However, piecing together the clues from the wider practitioner evidence, the literature and our own fieldwork, it is possible to speculate that the breadth of spillover effect is likely to be correlated to the strength of the individual's pro-environmental values. We may similarly speculate that spillover effects are least likely to occur for those with the weakest pro-environmental values, since these individuals are likely to perceive the weakest associations between the pro-environmental behaviours. Thøgersen

³⁶ See New Economics Foundation for Defra, 'Moments of change' as opportunities for influencing behaviour

(2004) provides support for this view; however, further research and testing would be required to validate these speculations.

5.3.2. Do spillover effects cut across behavioural ‘domains’?

Key insights from the literature reviewed in section 2 are that, while pro-environmental behaviours are often observed to co-occur, the strongest correlations are found between behaviours that are most conceptually similar (e.g. Thøgersen, 1999; 2004). Indeed, most of the research suggests that spillover is greatest between behaviours that belong to the same ‘domain’ (e.g. Barr, 2005; Thøgersen, 1999; Tucker and Douglas, 2008). However, this may be simply because these studies have set out to focus on a single domain; Thøgersen and Ölander (2003) and Byrka et al (forthcoming) find some evidence of more widespread, cross-domain spillover (see section 2).

In general, the very limited evidence suggests that although spillover can and does occur between behavioural categories (as defined by the respective researchers), it is more likely to occur between behaviours that are conceptually or semantically similar. However, the pilot exercise shows that conceptual similarity is not widespread amongst the pro-environmental behaviours included in the research, and the cluster analysis showed that the pro-environmental behaviours seem notable for their *unrelatedness*. Similarity founded in environmental constructs is uncommon amongst the set of behaviours studied in this research. Where ‘environmental’ similarity is perceived (for example, among the energy behaviours), the easier behaviours seem to be performed consistently (see the cluster analysis, section 4), but the consistency breaks down when more difficult behaviours are included (see the pilot exercise, section 3). Neither do the perceived commonalities between the behaviours seem well established – the sorting exercise showed that participants’ categories for these behaviours were highly fluid and changeable; and the categories were not the same for those who could be considered ‘green’ or ‘not green’. The fact that participants’ categories were not seemingly anchored in a well established conceptual framework could suggest that the participants did not normally think of these behaviours as ‘going together’.

The sorting exercise may tell us something about how people categorise within a specific behavioural domain and across a wider range of behaviours. The fieldwork suggested that participants used similar constructs to categorise ‘specific domain’ (waste) behaviours as they did to categorise the more general behaviours. The use of similar constructs (e.g. “food”) and ways of sorting (e.g. ‘things I do’ and ‘behaviour type’) suggests that there was no fundamental difference between the way participants approached categorisation within a specific domain and across more general domains. If this is the case (although it would be essential to confirm this using larger samples and a selection of different ‘domains’), it is possible that spillover would occur by a similar mechanism ‘within’ domains (e.g. among waste behaviours) and ‘across’ domains (e.g. between energy, waste and food behaviours).

An overarching insight from the evidence review and the exploratory primary research is that spillover works in different ways for different behaviours for different people in different contexts. From the evidence, it is not possible to identify single trigger behaviours that always and everywhere lead onto further action by an individual. In that context, the next section considers how insights from the evidence could inform approaches that seek to foster behavioural spillover or the multiple uptake of pro-environmental behaviours.

5.4 How can the process be stimulated: implications for policy and communications

As the above discussion has shown, the evidence is clear on seven points:

- Practitioners and academics believe that catalyst effects occur – that is, that past behaviours can have knock-on effects on future behaviours.
- It is equally clear though that the process is more complex than the idea that take-up of multiple pro-environmental behaviours can be triggered by any one individual or specific behaviour.. We have characterised a catalyst behaviour process as a specific form of more general spillover between behaviours which is rooted in more complex origins. These origins include personal attributes, preferences and values, the social context in which the behaviours occur and the practical barriers faced by individuals. Performance of a behaviour is often insufficient for spillover to take place, since a range of enabling contextual factors are often also required.
- Behaviours do co-occur, and are mentally categorised together by individuals, but in different combinations for different types of people and for different reasons.
- The process of spillover is hard to observe because so many different factors are implicated, which frequently causes too much ‘noise’ in research designed to capture it.
- That said, there are plausible mechanisms deriving from psychological theories that can help us to understand the reasons why spillover might happen and therefore how it might be facilitated.
- The ways in which people categorise behaviours, and the constructs³⁷ they rely on to devise these categories, are strongly implicated in many of the mechanisms that underlie the spillover process (e.g. consistency theories, foot in the door). However, the categories may be highly personal and fluid (at the individual level and over time). No ‘ideal set’ can be identified in the literature or through our pilot fieldwork.
- Most participants in the pilot study did not employ categories or sets based on environmental constructs: constructs (i.e. category descriptions) were generally multifaceted and based on practical issues of high relevance to the individual; environment was peripheral for most people in the way they made links between behaviours.
- Context is crucial to any spillover processes, where this refers both to the external situation, social norms and personal psychological factors (values, identity, norms, and so on).

The most we can conclude, therefore, is that catalyst based behaviour change refers to a set of diverse processes that can help explain why and how participating in a behaviour can lead to more generalised pro-environmental behaviour change. Rather than a single, coherent model of behaviour change, the idea of catalyst behaviours encompasses a number of different processes and techniques. From this perspective, the question then becomes something like:

³⁷ That is – the category descriptions used by participants.

How can we maximise the probability that individuals will take up multiple pro-environmental behaviours?³⁸

There are various starting points for spillover. The evidence review shows that behaviour change may be triggered by participating in new behaviours, but also may ‘spin off’ from existing behaviours. The trigger for spillover may also be performing a new behaviour *in a particular context* (for example, in a group setting) or performing a *particular type of behaviour* (for example, a highly visible one). The evidence review also demonstrates that the idea of catalyst behaviours does not refer to a single behaviour change process, but rather a number of different processes that can explain how behaviour change can spring from participation in a behaviour. Further, the evidence suggests that none of these processes is likely to cause behaviour change on its own: participating in a behaviour is rarely sufficient to lead to more generalised behaviour change, since a whole variety of enabling factors (both internal and external to the individual) must be in place.

This suggests that the idea of catalyst behaviours may not provide an operationally sound platform for high level policy. Given the uncertainty around the processes and the fact that unique ‘trigger’ behaviours do not seem to exist, relying on catalyst based behaviour change poses far too many risks for it to be a central plank of behaviour change strategies, in our view. That said, being alert to opportunities for enhancing (but not relying on) the chances of spillover in high level initiatives would be worthwhile; as would on-going consideration of how the government’s position on different environmental issues contributes to the general social norms around ‘desirable sets’ of behaviours.

Spillover may in fact have more potential to be a useful part of the behaviour change toolkit at a lower, more focused level. On a small scale, with a targeted and researched audience, there may be ways in which practitioners could optimise spillover effects.

To this end there are some general points we can make about catalyst behaviours and spillover, and some more specific things about which behaviours and which people might respond well to this type of intervention.

5.4.1. General considerations

Highlighting the links between behaviours

One of the most important pre-requisites for spillover of pro-environmental behaviours is a perceived relationship between the trigger and outcome behaviours. Highlighting the links between behaviours – helping people to understand *why* they ‘go together’ – would be a crucial step in fostering a spillover process.

Most of the potential explanations of the spillover process premise a structural relationship of *similarity* as a prerequisite for spillover from one behaviour to another. However, most behaviours are not just ‘environmental’ behaviours but have other dimensions too (e.g. money saving). If the aim is to encourage spillover along the environmental dimension of behaviours, emphasising the environmental links between

³⁸ Here we are concerned with behaviour change at the level of the individual rather than mass mobilisation or diffusion across communities or society as a whole, which has been explored in other Defra work, for example, Brook Lyndhurst (2009), “Influential individuals”; Sustainable Development Commission and National Consumer Council (2006), “I will if you will, Towards Sustainable Consumption”, Sustainable Consumption Roundtable.

behaviours may help to foster spillover through mechanisms such as the consistency theories and spreading activation (see appendix 5 for further ideas for future research in this area).

Which links?

It is important to note that the particular links that are highlighted will be key in how the spillover process works. Highlighting the environmental links is likely to appeal most to the greenest people. Highlighting other commonalities (such as health or money saving benefits) may fit with how most people naturally think about the behaviours (as suggested by the pilot fieldwork), but also runs the risk of ‘crowding out’ environmental motivations (see section 2.5.3). Crowding out has its own negative spillover risks for more ‘difficult’ behaviours where difficulty or cost would otherwise be offset by the individual against their stronger environmental motivations.

Cueing common goals

Perceptions of similarity are crucial for many of the spillover processes identified during the evidence review. For example, consistency theories show that people strive to behave in a consistent manner. For consistency or inconsistency to be possible, there must be some links perceived between the behaviours. Similarity based on a common goal is required for techniques such as *foot in the door*, which leverage this desire to behave consistently, as well as commitment to the common goal.

Learning by doing

This may increase an audience’s perceived ability to perform and succeed in a behaviour (increase their sense of **self efficacy**), which may spill over to related behaviours. This points to finding opportunities for direct public engagement through ‘try it and see’ approaches, as well as encouraging the development (or retention) of skills that support pro-environmental behaviour (e.g. cooking, mending, gardening and so on).

Cueing existing behaviour as pro-environmental

As we have seen, spillover may stem not only from participation in new behaviours, but may also spin off from existing behaviours as “the next natural step.” This process could potentially be optimised through the **cueing of existing behaviour as pro-environmental**. Making existing behaviour patterns diagnostic of ‘the sort of thing a green person would do’ could perhaps engage with an audience’s self perception and set the context for further change in accordance with a **greener self identity**.

Understanding the limits posed by the values of different audiences

It is important to note, however, that these processes will not work in the same way for all audiences. The **values** held by the audience are a crucial independent variable in all of them. For example, dissonance caused by inconsistency is stronger among those for whom the subject matter is more important or closer to their self concept. Similarly, cueing behaviours as pro-environmental could backfire among an audience whose values were at odds with environmental concern. This suggests that, as with many behaviour change processes, spillover processes are more likely to find most traction among those who already have the strongest pro-environmental values.

Removal of external barriers

Spillover effects are often thought to be suppressed by external conditions, and removal of external barriers common to several behaviours could function as a trigger for change.

Being alert to risks of negative spillover

However, spillover can also be blocked by other factors, not least through participation in certain behaviours. Negative spillover, or behaviours that function as blockages to further behaviour change, are a real risk for any campaign designed around spillover. Negative effects are found throughout the spillover evidence base and seem to often occur ‘naturally’, outside of pro-environmental interventions or campaigns. For example, several studies indicate that, for some people in some situations, recycling may act as a terminal behaviour, rather than a trigger behaviour, by providing them with an excuse or alibi not to participate further. The latter is also relevant to national campaigns in which behaviours are signalled (directly or inadvertently) to the public as the aspirational ‘set’; there was a great deal of discussion in the expert workshop about the role of ‘small behaviours’ as either catalysts or terminal behaviours. Again, the importance of the *values* held by the audience is clear in relation to negative spillover.

Trust that the messenger is competent to talk about the target behaviours

The marketing literature suggests that the messenger is as important as the message. A company co-marketing a new product as an extension of, or under the umbrella of, an established, trusted brand, must be perceived to have the right skills and knowledge to effectively deliver that product. Successful brand extensions or alliances rely not only on the customer’s positive attitude towards the ‘parent’ product, but also on their trust in the company’s competence to deliver the new product.

This suggests a possible parallel in environmental behaviour communications – a lack of fit between the messenger and the message, or a messenger that lacks credibility in the eyes of the audience, may jeopardise a communications campaign. As highlighted in the discussion of the spillover of moral indignation in section 2.4.2, negative (or anti-social) behavioural outcomes can occur when an audience feels that an authority has lost legitimacy and following the rules becomes less important.

Influencing the general social context and social norms on the environment

Finally, a theme of the practitioner and academic evidence is that the general social context around the environment is of fundamental importance to how the process of spillover occurs and its outcomes. Positive enabling conditions at the level of social norms and attitudes are an important determinant of spillover, whether natural or intervention led, psychological or structural, and so on. This again points to the importance of consistency in messaging about environmental issues and the government’s expectations of the public. At a practical level, it also points to support for those who are influential in shaping pro-environmental social norms on the ground, whether they are individuals or communities (e.g. through Defra’s Greener Living Fund or, previously, Every Action Counts).

5.4.2. Specific considerations

Which people?

There was no direct evidence in the literature on which kinds of people are more likely to experience spillover. Our pilot fieldwork and exploratory data analysis, however, point to variations in the co-occurrence of behaviours across different groups; and the theoretical work suggests that spillover would be more likely among those with ‘greener’ values. There is no reason, though, why spillover would not occur among any audience, except those who perceived no links between the behaviours whatsoever.

The evidence that exists suggests that spillover among pro-environmental behaviours is more likely to occur among those people who have an established set of green pro-environmental values. This could be conceptualised, in the light of the pilot exercise, as those people who use ‘environment’ as a construct when

categorising their behaviour. Similarly, the cluster analysis suggests that co-occurrence (or consistent performance of behaviours) is strongest among the greenest people (though it should be noted this was only a preliminary analysis and needs further investigation).

The pilot exercise indicated that most people's categories around the pro-environmental behaviours are fluid and malleable. Marketing research also suggests that new sets can be created and new products brought together using a variety of communications and advertising techniques. Together, this suggests that spillover need not be founded in established, pre-existing sets or categories. It may be possible, within certain boundaries, to foster new links between previously unrelated behaviours. Where the conceptual boundaries lie is likely to depend on the characteristics of the audience, including their existing behaviour patterns and categorisations, and their norms, beliefs and values.

Our preliminary work has suggested that behaviours co-occur in different 'sets' across the Defra segments and it may be worth undertaking further research to further identify both patterns and the mental constructs underpinning them. Knowing how different types of people or target audiences categorise behaviours is currently a gap in the literature. Suggestions for further research are included in appendix 5.

Which behaviours?

No single behaviour was identified in the literature as being a candidate for a 'catalyst' behaviour and equally no consistent 'set' of behaviours was identified as a basis for spillover.

The literature suggests that trigger behaviours may differ not only across people and contexts, but also over time. For example, evidence from the literature suggests that a decade ago, participation in recycling, which was relatively uncommon, sometimes led on to participation in wider behaviours (Thøgersen and Olander, 2003; Berger, 1997). However, as recycling has become more widespread, it has become less diagnostic of a green attitude and so ceased to play such an important role in spillover processes. The evidence also suggests that recycling may even be responsible for some negative effects among some people, perhaps because some individuals treat it as an 'alibi' for not participating in other, less common behaviours (e.g. waste prevention) (Thøgersen, 2004 – see section 2.5.3).

We have argued in this research that the catalyst process is unlikely to be a linear path from one behaviour to other behaviours. Instead, spillover may more often depend on behaviours *going together* in a more reciprocal manner. Behaviour change is unlikely to result from the promotion of a single behaviour, but rather from a package of experience, including the behaviours themselves but also the context in which those behaviours occur – the 'contextual noise' (including internal conditions such as values, norms and so on, as well as external conditions) that either enables or blocks spillover. The fact that linear causal relationships between behaviours are likely to be at best weak (see section 2.5) gives rise to the question of whether we need to uncover the causal paths between behaviours at all, or whether it is sufficient to base interventions on the structural, reciprocal relationships between the chosen set. In practical terms, this represents the difference between focusing on a hypothesised 'trigger' behaviour, versus 'co-marketing' a set of behaviours together.

To summarise, 'spillover' is simply a description of a number of ways in which past behaviours may feed into future behaviours and as such is subject to many of the same considerations as any other behaviour change model. The evidence suggests that spillover relies upon many of the same psychological processes that have been highlighted as important in relation to behaviour change in Defra's other research. The pro-

environmental behaviours evidence base suggests that there is no single solution to securing wider uptake of behaviours. This review further finds no evidence of the existence of catalyst behaviours that in all circumstances and for all people lead to generalised pro-environmental behaviours. The review and fieldwork do suggest, however, that consideration of spillover processes could be one part of efforts to encourage further behaviour change with some groups of people and with some behaviours, provided that the potential risks and lack of certainty that it will work are well understood.

5.5 Conclusions

The existing pro-environmental behaviours evidence base is clear that there is no single or simple solution to facilitating pro-environmental behaviour change. This research suggests that neither is there a 'silver bullet' catalyst behaviour or behaviours that may be relied upon to have a knock on effect and lead to the uptake of multiple pro-environmental behaviours. There may be some knock-on effects from some behaviours to others in some contexts for some individuals. However, the 'catalyst behaviour' hypothesis does not, on its own, provide an operationally useful platform, since it is difficult to isolate the catalyst process and to disentangle it from the host of other influencing factors that are necessary for behaviour change.

Indeed, this research, along with other behaviour change research, suggests that these different factors are likely to be indistinguishable because they are interdependent: our definition of a 'behaviour' should not be limited to the action alone, but should include a much wider set of contextual factors. The evidence suggests that encouraging a particular action is unlikely to result in the uptake of further, multiple actions in the absence of a complex set of internal and external enabling conditions. In other words, any behaviour change intervention - including those aiming to encourage spillover - would have to take a holistic approach and attend to the wider behavioural context in which actions occur, as well as the 'core' processes by which behaviour changes.

However, this is not to say that the idea of catalyst behaviours may not prove to be a useful frame for communications campaigns and action programmes. Rather than a single process that may be operationalised through policy and communications, the idea of catalyst behaviours may be viewed more realistically as a set of behaviour change processes and contexts. These processes and contexts can help to explain how and why participating in particular pro-environmental behaviours can, in some situations for some people, lead to the uptake of multiple pro-environmental behaviours. Gaining a deeper understanding of these processes and the conditions in which they are most likely to occur may provide a useful focus for campaigns.

A key insight from this work on catalyst behaviours is the importance of understanding how different target audiences make links between different pro-environmental behaviours, whether they think of them as a coherent 'set' and whether this 'set' is defined as being 'environmental' or something else. Understanding how audiences 'construct' a conceptual world of multiple behaviours will help policy makers and communicators to identify the right conditions for optimising the chances that catalyst effects will occur.

As with any behaviour change intervention, however, and perhaps more so with spillover, there are risks associated with using it as an intervention strategy. In the absence of clear evidence about how the process works in the context of different behaviours, different people and different social groups, there is a very real risk of the process backfiring. The 'wrong' trigger behaviour (too big or too small, too hard or too easy) could in fact turn out to be a block; and promotion of the 'wrong' set could limit further progress or even reverse

positive effects. The risks of negative spillover cannot be discounted from any discussion of catalyst behaviours.

As with any type of behaviour change, it turns out that catalyst behaviours do not provide the answer to the problem. They may, however, provide part of the answer, as part of a wider, more holistic approach to changing lifestyles.

Appendix 1: Bibliography

- Aaker, D.A. and Keller, K.L. (1990). Consumer evaluations of brand extensions. *Journal of marketing*, 54, pp. 27 - 41
- Aarts, H., Verplanken, B., & van Knippenberg, A. (1998). Predicting behavior from actions in the past: repeated decision-making or a matter of habit? *Journal of Applied Social Psychology*, 28, 1355–1374.
- Ajzen, I (2002). Residual Effects of Past on Later Behavior: Habituation and Reasoned Action Perspectives. *Personality and Social Psychology Review*, Vol. 6, No. 2, 107-122 (2002)
- Arbuthnot, J. (1977) . The roles of attitudinal and personality variables in the prediction of environmental behaviour and knowledge. *Environment and Behavior* 9, 217-232.
- Audrain-McGovern, J., Rodriguez, D., Wileyto, P., Schmitz, K and Shields, P. (2006). Effect of team sport participation to adolescent smoking progression. *ARCH GEN PSYCHIATRY/VOL 63*, 433
- W. Austin, E. Walster (1974). Reactions to confirmation and disconfirmation of equity and inequity. *Journal of Personality and Social Psychology*, Vol. 30 pp.208 - 216
- Bamberg, S. (2003). How does environmental concern influence specific environmentally related behavior? A new answer to an old question. *Journal of Environmental Psychology*. Vol.23. p21-32
- Barnett J (2004) The Multiple Sorting Procedure. In Breakwell, G M, (Ed), *Research Methods in Social Psychology*, BPS Blackwells: Oxford
- Barr, S. (2005). Defining the multi-dimensional aspects of waste management: A study of reported behaviour in Devon. *Resources Conservation and Recycling*, 45, 172-192
- Barr, S. (2007). Factors influencing environmental attitudes and behaviours. *Environment and Behavior*, Vol. 39, No. 4, 435-473 (2007)
- Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.). *Advances in experimental social psychology*, Vol. 6 (pp. 1–62). New York: Academic Press.
- Bem, D.J. and Allen, A. (1974). On predicting some of the people some of the time: the search for cross-situational consistencies in behaviour. In *Personality: Critical Concepts in Psychology*. By Cary L. Cooper, Lawrence A. Pervin, II. Published by Routledge
- Berger, I. E. (1997). The demographics of recycling and the structure of environmental behavior. *Environment and Behavior*, 29, 515–531.
- Berrigan, D, Dodd, K, Troiano, R, Krebs-Smith, S and Ballard Barb, R. (2003). Patterns of health behavior in U.S. adults. *Preventive Medicine* 36 (2003) 615–623.

- Biswas, A., Licata, J. W., McKee, D., Pullig, C. and Daughtridge, C. (2000). "The Recycling Cycle: An Empirical Examination Of Consumer Waste Recycling And Recycling Shopping Behaviors," *Journal of Public Policy & Marketing*, Vol.19 No.1, pp. 93-105
- Bottomley, P.A, and Holden, S. (2001). Do we really know how consumers evaluate brand extensions? Empirical generalisations based on secondary analysis of eight studies. *Journal of Marketing Research*; Nov 2001; 38, 4; p.494
- Bratt, C. (1999a). Consumers' environmental behavior: Generalized, sector-based, or compensatory? *Environment and Behavior*, 31, 28–44.
- Brenner, M, J. Brown & D. Canter (Eds.), *The research interview: Uses and approaches*. London: Academic Press.
- Brook Lyndhurst (2008). Investigating 'mavens' with regard to environmental behaviours, and the linkages between mavens, social norms, identity and trust for mainstream consumers. Report to Defra.
- Byrka, K., Kaiser, F.G. (forthcoming). Substantiating spill-over effect in conservation behavior. Contribution at the 26th International Congress of Applied Psychology. Athens, Greece
- Canter, D.V., Brown,J., & Groat,L. (1985). A multiple sorting procedure for studying conceptual systems. In M. Brenner, J. Brown, & D. V. Canter (Eds.). *The Research Interview: Uses and approaches* . London: Academic Press
- Collins, A. M., & Loftus, E. F. (1975). A spreading activation theory of semantic memory. *Psychological Review*, 82, 407±428."
- Cox, J; Wilkins, C; Ledsom, A; Drayson, R; Kivinen, E (2009). Environmental Action Fund (EAF): A Review of Sustainable Consumption and Production Projects (SCP2.2). A report to the Department for Environment, Food and Rural Affairs. Brook Lyndhurst. Defra, London.
- Crompton, T. (2008). *Weathercocks and Signposts: The environment movement at a crossroads*, WWF, available at http://assets.wwf.org.uk/downloads/weathercocks_report2.pdf
- Crompton, T. & Thøgersen, J. (2009). Simple and Painless? The limitations of spillover in environmental campaigning. WWF
- DeiVecchio D. (2000). Moving beyond fit: the role of brand portfolio characteristics in consumer evaluations of brand reliability, *Journal of Product and Brand Management*, Volume 9, Number 7, 2000 , pp. 457-471(15)
- Department of Health (2008). *Healthy Ambitions: segmentation model*.
- Dickinson, D. and Oxoby, R. (2007). 'Cognitive Dissonance, Pessimism, and Behavioral Spillover Effects' Working Papers 2007-09, Department of Economics, University of Calgary, revised 26 Oct 2007.
- Dietz, T., Fitzgerald, A., & Shwom, R. (2005). Environmental values. *Annual Review of Environment and Resources*, 30, 335-372.

- Dobbyn, J and Thomas, G. (2005). Seeing the light: impact of microgeneration on the way we use energy. Report for the Sustainable Consumption Roundtable. UK Sustainable Development Commission, London.
- Dobbyn, J and Thomas, G. (2005). Seeing the light: the impact of micro-generation on our use of energy, Hub Consultants for Sustainable Consumption Roundtable
- Donohue B., Romero V., Hill H.H (2006). Treatment of co-occurring child maltreatment and substance abuse. *Aggression and Violent Behavior*, 11 (6) pp. 626-640.
- Dur, R (2006). Status-seeking in criminal subcultures and the double dividend of zero-tolerance. Cesifo working paper no. 1762, category 10: empirical and theoretical methods
- Element Energy (2008). The Growth Potential for microgeneration in England, Wales and Scotland. Cambridge: Report commissioned by the Department of Business, Enterprise and Regulatory Reform, NGOs. Energy Saving Trust and industry, available from www.berr.gov.uk/energy/microgenerationresearch
- ERM (2007). Evaluation of the Big Lottery's Transforming Waste Programme: Final Report, Environmental Resources Management for the Big Lottery Fund
- Fazio, R. H. (1986). How do attitudes guide behavior? In: R. M. Sorrentino, & E. T. Higgins, *The handbook of motivation and cognition: Foundations of social behavior* (pp. 204±243). New York: Guilford Press.
- Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Stanford, CA: Stanford University Press
- Fishbein, M and I Ajzen (1975). *Belief, Attitude, Intention and Behavior: an introduction to theory and research*, Addison-Wesley, Reading, MA.
- Freedman, J.L. & Fraser, S.C. (1966). Compliance without pressure: The foot-in-the-door technique. *Journal of Personality and Social Psychology*, 4, 195-202.
- Frey, B (1993). Motivation as a limit to pricing. *Journal of Economic Psychology*, 14 (4) 635 - 664
- Gardner, G. T., and Stern, P. C.. (1996). *Environmental Problems and Human Behavior*. Allyn & Bacon, Boston, 1996.
- Getaneh, Mekonen, Eshetu & Pose (2008). Community conversation as a catalyst for stigma reduction and behaviour change. CARE 2008, available at http://www.kit.nl/net/KIT_Publicaties_output/ShowFile2.aspx?e=1452
- Girandola, F. (2002). Sequential requests and organ donation. *The Journal of Social Psychology*, 2002, 142(2) 171–178.
- Global Action Plan (June 2008) EcoTeams Evaluation Report (unpublished)
- Government Social Research Rapid Evidence Review Toolkit (2008). http://www.gsr.gov.uk/professional_guidance/rea_toolkit/index.asp

- Gray, D.B. (1985). *Ecological beliefs and behaviours: assessment and change*. Westport, CT: Greenwood Press.
- Green Alliance (2006). *Achieving step change behaviours*. Green Alliance 2006
- Greifeneder, R, Bless, B, Kuschmann, T. (2007). Extending the brand image on new products: the facilitative effect of happy mood states. *Journal of Consumer Behaviour* 6:1, 19-31
- Griffin, R.J., Neuwirth, K., Giese, J., Dunwoody, S. (2002). Linking the heuristic systematic model and depth of processing. *Communication Research*, 29 (6), 705-732
- Gutman, J (1982). A Means-End Chain Model Based on Consumer Categorization Processes. *Journal of Marketing* 46(2). 60-72.
- Hampshire County Council and Brook Lyndhurst (2008). *Small Changes Big Difference Towards a Materials Resource Authority: Promoting Practical Waste Prevention and Exploring Options for Resource Management*. WR0117, Defra, London.
- Hastings, G and Saren, M. (2003). The critical contribution of social marketing. *Marketing Theory*, Volume 3(3): 305–322
- Herbout, V, Guéguen, and Grandjean, I (2008). Foot-In-The-Door Application in Organization: How Employees Could be More Effective? *European Journal of Scientific Research* Vol.21 No.4 (2008). pp.729-735
- Herring, H and Roy, R. (2007). Technological innovation, energy efficient design and the rebound effect, *Technovation*, Vol 27, pp. 194-203
- Hertwich, E. G. (2005). Consumption and the rebound effect - An industrial ecology perspective. *Journal of Industrial Ecology*, 9, 85-98.
- Holland, R.W., Verplanken, B., & van Knippenberg, A. (2003). From repetition to conviction: Attitude accessibility as a determinant of attitude certainty. *Journal of Experimental Social Psychology*, 39, 594-601.
- Hopkins, K. (2005). Family communication: A catalyst for socially desired behaviours. *Prism* 3 (2). Available at: <http://praxis.massey.ac.nz>
- Jackson, T (2004). *Motivating Sustainable Consumption - a review of evidence on consumer behaviour and behaviour change*. A report to the Sustainable Development Research Network. London: Policy Studies Institute.
- Jin, J. Y., Perote-Peña, J., & Troege, M. (2004). Learning by doing, spillovers and shakeouts. *Journal of Evolutionary Economics*, 14, 85-98.
- Johnston, L, MacDonald, R, Mason, P, Ridley, L and Webster, C (2000). *Snakes and Ladders: Young people, transitions and social exclusion*. Bristol: The Policy Press for the Joseph Rowntree Foundation.

- Kaiser, F. G. & Wilson, M. (2004). Goal-directed conservation behavior: the specific composition of a general performance. *Personality and Individual Differences*, 36, 1531-1544.
- Kallgren, C. A., Reno, R. R., & Cialdini, R. B. (2000). A focus theory of normative conduct: When norms do and do not affect behavior. *Personality and Social Psychology Bulletin*, 26, 1002-1012.
- Kandel, D. B. and Yamaguchi, K. (1993). From beer to crack: developmental patterns of drug involvement, *American Journal of Public Health* 83, 851-85
- Kelly, G. (1955). *Principles of Personal Construct Psychology*. New York: Norton, 1955.
- Kirchmeyer, C. (1992). Perceptions of Nonwork-to-Work Spillover: Challenging the Common View of Conflict-Ridden Domain Relationships. *Basic and Applied Social Psychology*, Volume 13, Issue 2 June 1992 , pages 231 - 249
- Klockner, C, and Matthies E. (2004). How habits interfere with norm-directed behaviour: A normative decision-making model for travel mode choice. *Journal of Environmental Psychology* 24 (2004) 319–327"
- Knussen, C and Yule, F. (2008). "I'm Not in the Habit of Recycling": The Role of Habitual Behavior in the Disposal of Household Waste. *Environment and Behavior*, September 1, 2008; 40(5): 683 - 702
- Kremer, Y. & Harpaz, I. (1982). Leisure patterns among retired workers: Spillover or compensatory. trends? *Journal of Vocational Behavior*, 21(2). 183– 195
- Kulig K, Brener ND, McManus T. (2003). Sexual Activity and Substance Use Among Adolescents by Category of Physical Activity Plus Team Sports Participation. *Arch Pediatr Adolesc Med*. 157: 905-912
- Laaksonen, M, Lahelma, E, Prattala, R. (2002). Associations among health-related behaviours: sociodemographic variation in Finland. *Soz.- PrEventivmed*. 47 (2002) 225- 232
- Loeber, R and Hay, D. (1997). Key issues in the development of aggression and violence from childhood to early adulthood. *Annual Review of Psychology* Vol. 48: 371-410
- Lord, C.G, Ross, C.M. and Leper, L. (1979). Biased assimilation and attitude polarisation: the effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology*, 11, 2098-2109.
- McKenzie-Mohr, D. and Smith, W. (2006). *Fostering Sustainable Behaviour: An introduction to community based social marketing*. New Society Publishers 2006.
- Midden, C. J. H., Kaiser, F. G., & McCalley, L. T. (2007). Technology's four roles in understanding individuals' conservation of natural resources. *Journal of Social Issues*, 63, 155-174.
- Morabia, A, Curtin, F and Bernstein, MS. (1999). Effects of smoking and smoking cessation on dietary habits of a Swiss urban population. *European Journal of Clinical Nutrition* (1999) 53, 239-243
- Morven G, McEachern, Gary Warnaby, Marylyn Carrigan and Isabelle Szmigin (2008). Thinking locally, acting locally? *Conscious consumers & farmers' markets*

- Mullen E. & Nadler, J. (2008). Moral Spillovers: The Effect of Moral Mandate Violations on Deviant Behavior, 44 JOURNAL OF EXPERIMENTAL SOCIAL PSYCHOLOGY 1239-1245 (2008).
- Murphy, Gregory L.; Medin, Douglas L. (1985). The role of theories in conceptual coherence. Psychological Review. Vol 92(3). Jul 1985, 289-316.
- Nye, M and Burgess, J. (2008). Promoting Durable Change in Household Waste and Energy Behaviour: technical research report completed for Defra University of East Anglia
- Olli, E., Grendstad, G. and Wollebaek, D. (2001). Correlates of environmental behaviours. Environment and Behavior, 33 (2). 181-208.
- Open University and EST (2008). YIMBY Generation – Yes in my back yard! UK Householders pioneerig microgeneration heat June 2008 by the Open University's Design Innovation Group/Sustainable Technologies Group and the Energy Saving Trust; available from <http://design.open.ac.uk/research/documents/YIMBYGeneration.pdf>
- Osbaldiston, R and Sheldon, K.M. (2003). Promoting internalized motivation for environmentally responsible behavior: A prospective study of environmental goals. Journal of Environmental Psychology Volume 23, Issue 4, December 2003, Pages 349-357
- Padrão, P, Lunet, N, Santos, A.C and Barros, H. (2007). Smoking alcohol and dietary choices - evidence from the Portuguese National Health survey. BMC Public Health 2007, 7:138.
- Pol A. C. Lier, Frank Vitaro, Edward D. Barker, Hans M. Koot, Richard E. Tremblay (2008). Developmental Links Between Trajectories of Physical Violence, Vandalism, Theft, and Alcohol-Drug Use from Childhood to Adolescence. Journal of Abnormal Child Psychology (2009)
- Poortinga, W. (2007). The prevalence and clustering of four major lifestyle risk factors in an English adult population. Preventive Medicine Volume 44, Issue 2, February 2007, Pages 124-128
- Regan, D. and Fazio, R. (1977). On the Consistency Between Attitudes and Behavior: Look to the Method of Attitude Formation. Journal of Experimental Social Psychology, 13, 1, 28-45, Jan 77.
- Rosenberg, M.J., (1956). Cognitive structure and attitudinal affect. J. Abnorm. Soc. Psychol. 53 September, pp. 367–372
- Rosengard, C (2006). Co-Occurring Sexual Risk and Substance Use Behaviors Among Incarcerated Adolescents. Journal of Correctional Health Care, Vol. 12, No. 4, 279-287 (2006)
- Ross, A.B. and Thow, M.K. (1997). Exercise as a catalyst. Coronary Health Care (1997) 1, 124-129.
- Russell R. Pate, Gregory W. Heath, Marsha Dowda, and Stewart G. Trost, (1996). Associations between physical activity and other health behaviours in a representative sample of US adolescents. American Journal of Public Health, Vol 86, no.11

- Shelle, P and Pittock, J (undated). Restoring the Kafue Flats : A partnership approach to environmental flows in Zambia. WWF. Available at <http://assets.panda.org/downloads/restoringkafueflatsschellepittockriversymposium3sept05.pdf>
- Schwartz, S (1996). Value priorities and behaviour: applying a theory of integrated value systems in Seligman et al (1996) *The Psychology of Values: the Ontario symposium* (Routledge)
- Schwartz, S. H. (1977). Normative Influences on Altruism. In L. Berkowitz (ed.). *Advances in Experimental Social Psychology*, Volume 10, 221-279. New York: Academic Press.
- Shine, B, Park, J and Wyer R, (2007). Brand Synergy Effects in Multiple Brand Extensions. *J of Marketing Research*, Vol. 44, No. 4, November 2007, 663–70
- Simonin, B.L and Ruth, J.A. (2000.) Bundling as a strategy for new product introduction: Effects on consumers' reservation prices for the bundle, the new product, and its tie-in. *Journal of Business Research*, Volume 33, Issue 3, July 1995, Pages 219-230
- Simonin, B.L. and Ruth, J.A. (1998). Is a company known by the company it keeps? Assessing the spillover effects of brand alliances on consumer brand attitudes. *Journal of Marketing Research*, 35, 30-42
- Smith,E.E., & Medin,D.L. (1981). *Categories and concepts*. London: Harvard Press.
- SMP (2007). *Innovative Approaches To Sustainable Consumption and Production - Case Study Compendium*.
- Snijders, T., Steglich, C. and Schweinberger, M. (2006). Modeling the co-evolution of networks and behavior. In *Longitudinal Models in the Behavioral And Related Sciences*, ed. K. van Montfort, H. Oud and A. Satorra. Hillsdale, NJ: Lawrence Erlbaum
- Somerset CC - Application for 'Best Local Authority recycling Initiative' and presentation slides (unpublished)
- Sparks, P., Shepherd, R. (1992). "Self-identity and the theory of planned behaviour: assessing the role of identification with 'Green consumerism'", *Social Psychology Quarterly*, Vol. 55 No.4, pp.388-99.
- Staats H, Harland P, Wilke H, (2004). "Effecting Durable Change: A Team Approach to Improve Environmental Behavior in the Household" *Environment and Behavior* 36 341-367
- Stern, P. C. (2000b). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56, 407–424."
- Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A.,& Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmental concern. *Human Ecology Review*, 6, 81–97."
- Strecher, V.J., Brenda McEvoy DeVellis, Marshall H. Becker and Irwin M. Rosenstock (1986). The role of self-efficacy in achieving health behaviour change. *Health Educ Behav* 1986; 13; 73
- Sustainable consumption Roundtable (2006). I will if you will: towards sustainable consumption. Sustainable Development Commission and National consumer Council, 2006. Available at http://www.sd-commission.org.uk/publications/downloads/I_Will_If_You_Will.pdf

- Terry D. J.; Hogg M. A.; White K. M. (1999). The theory of planned behaviour: Self-identity, social identity and group norms. *British Journal of Social Psychology*, Volume 38, Number 3, September 1999 , pp. 225-244(20)
- Thøgersen, J. & Ölander, F. (2006). To what degree are environmentally beneficial choices reflective of a general conservation stance? *Environment and Behavior*, 38, 550-569.
- Thøgersen, J. (1999). Spillover processes in the development of a sustainable consumption pattern. *Journal of Economic Psychology*, 20, 53-81.
- Thøgersen, J. (2004). A cognitive dissonance interpretation of consistencies and inconsistencies in environmentally responsible behavior. *Journal of Environmental Psychology*, 24, 93-103.
- Thøgersen, J. (2006). Norms for environmentally responsible behaviour: An extended taxonomy. *Journal of Environmental Psychology*, 26, 247-261
- Thøgersen, J. and Ölander, F. (2003). 'Spillover of environment-friendly consumer behaviour.' *Journal of Environmental Psychology* 23 (2003) 225–236
- Thomas C, Yoxon M, Slater R and Leaman J (2004). 'Changing Recycling Behaviour: An Evaluation of Attitudes and Behaviour to Recycling in the Western Riverside Area of London' Waste 2004 Integrated Waste Management and Pollution Control Conference, Stratford-upon-Avon, UK
- Thomas, C (2004). 'Public Attitudes and Behaviour in Western Riverside' Report for Waste Watch from The Open University's Integrated Waste Systems Research Group and MORI Social Research Institute, The Open University, Milton Keynes
- Thompson DR, Bowman GS, Kitson AL, de Bono DP, Hopkins A. (1997). Cardiac rehabilitation services in England and Wales: a national survey. *International Journal of Cardiology*, Volume 59, Issue 3, Pages 299-304"
- Thompson, S., Michaelson, J., Abdallah, S., Johnson, V., Morris, D., Riley, K., & Simms, A. (2011). 'Moments of change' as opportunities for influencing behaviour: A report to the Department for Environment, Food and Rural Affairs. nef (the new economics foundation). Defra, London.
- Tubman, J.G., Gil, A.G., and Wagner, E.F. (2004). Co-Occurring Substance Use and Delinquent Behavior during Early Adolescence. *Criminal Justice and Behavior*, Vol. 31, No. 4, 463-488
- Tucker P and Speirs D (2002). 'Model forecasts of recycling participation rates and material capture rates for possible future recycling scenarios' University of Paisley Environmental Technology Group, Paisley, UK
- Tucker, P and Douglas, P. (2007). Understanding Household Waste Prevention Behaviour: Final Report, Defra project WRT109, University of Paisley Environmental Technology Group and technical annexes
- Tucker, P., Speirs, D. (2003). "Relationships Amongst Waste Management Behaviours". CIWM Scientific and Technical Review, 4(1). 2-8, (2003).

- Ussher, M., Taylor, A. West, R. and McEwen, A. (2000). Does exercise aid smoking cessation? A systematic review. *Addiction* Volume 95 Issue 2, Pages 199 - 208
- Velicer, W. F, Prochaska, J. O., Fava, J. L., Norman, G. J., & Redding, C. A. (1998). SMOKING CESSATION AND STRESS MANAGEMENT : APPLICATIONS OF THE TRANSTHEORETICAL MODEL OF BEHAVIOR CHANGE. *Homeostasis*, 1998, vol. 38, no5-6, pp. 216-233
- Verhoef, P. C. (2005). Explaining purchases of organic meat by Dutch consumers. *European Review of Agricultural Economics*, 32, 245-267.
- Walchli, S.B. (2007). The effects of between-partner congruity on consumer evaluation of co-branded products. *Psychology and Marketing* 24:11, 947-973
- Wankel L, Sefton J (1994). Physical activity and other lifestyle behaviours. In: Bouchard C, Stephard R, Stephens T, eds. *Physical activity, fitness and health*. Champaign, IL: Human Kinetics: 530-50.
- Washburn J.H.1; Till B.D.2; Priluck R. (2000). Co-branding: brand equity and trial effects. *Journal of Consumer Marketing*, Volume 17, Number 7, 2000 , pp. 591-604(14)
- Watten R (1999). Smokers and non-smokers: differences in alcohol consumption and intake of other health-related substances in Norway: a general population study. *Eur J Public Health* 9: 306-8.
- Westphal, James; Johnson, Lera Joyce (2007). Multiple Co-occurring Behaviours among Gamblers in Treatment: Implications and Assessment. *International Gambling Studies*, Volume 7, Number 1, April 2007 , pp. 73-99(27)
- Wilson, J. & Musick, M. A. (1997). Work and volunteering: The long arm of the job. *Social Forces*, 76, 251-272.

Appendix 2: Sources and search terms used in the evidence search

The aim of the scoping exercise was to create a ‘map’ of the different areas and to establish (a) what evidence exists and (b) to what extent this evidence addresses the research questions.

The evidence search consisted of:

- focused searches in the PsychInfo, Econlit and Web of Science academic databases;
- key word searches in online journal databases, including Science Direct and Ingenta;
- browsing key journals, such as the *Journal of Environmental Psychology* and *Environment and Behavior*;
- key word searches of various internet search engines, including Google, Google Scholar, Green Maven, Lycos, WasteNet;
- snowballing through the bibliographies of key papers;
- citation searches for key papers;
- key author/practitioner searches; and
- searches in the online research archives of various ‘practice’ organisations.

Examples of search terms used for key word searches

Note that this is not an exhaustive list of search terms used

1. Catalyst + behaviour + environmental	2. Cross effects
3. Cataly* + Behav*	4. Interrelated propensities to behave
5. Spillover + behav*	6. Covariance
7. (Transfer) + environment* + behav*	8. Foot in the door
9. Cascade + behav*	10. Co-benefits + behaviour + social
11. Trigger + behav*	12. Rebound effect
13. Fan out effect + behav*	14. Knock on effect
15. Cascade + behav*	16. Ripple effects
17. Knock on effect + behav*	18. Bundles behaviours
19. Associative + behav*	20. Clusters behaviours
21. Spill-over + behav*	22. Drag effects + behav*
23. Learning by doing (+ social + behav*)	24. Learning by observation
25. Co-occurring behav* + environ* + health	26. Trigger behaviours
27. Co evolutionary + behaviour	28. Synergy

29. Double dividend effects	30. Brand alliances
31. Intertemporal consistency	32. Co-marketing
33. Transfer + behaviour + social	34. Co-evolutionary' behaviours
35. Cross lagged effects	36. Conveyor belts
37. Transtheoretical model	38. Marketing spill-over purchases
39. Ladders + behav* + environment* + social	40. Brand extensions
41. Crime co-occurring	42. Criminal behaviour catalyst

Table 13 Examples of search terms

Appendix 3: Practitioner evidence

Table 14 Practitioner evidence summary

	Project / scheme / evaluation	Description of project or intervention	Catalytic effects found	Measured or anecdotal?
1. Adopting a new behaviour leads to the adoption of other behaviours				
1.	Study of UK Householders pioneering microgeneration by the Open University and the Energy Saving Trust	Early adopters of microgeneration (n=90) were interviewed to assess what other sustainable energy behaviours they had adopted	About 75% of microgeneration adopters say that they are more aware of their energy use; make more effort to save energy; have adapted their behaviour to make the best use of the hot water and heat they now generate. 66% have insulated their homes (in some cases beyond the level needed to get a grant) and use energy efficient appliances; 5% have installed solar PV	Measured – self reported by respondents
2.	Global Action Plan's Eco-teams project with 1886 volunteers in the South East, South West and Nottingham	Team based action project where a group of volunteers engage in monthly facilitated meetings in which they discuss a series of environmental themes, such as transport, water and waste. Secondly, participants are required to weigh and measure their rubbish / recycling and electricity / natural gas use each month and to provide figures from these exercises to the facilitator.	Survey data showed respondents who finished the programme up to three years previously were now engaged in more pro-environmental actions than those who just finished in the last year. They are also starting to engage in the 'next level' of activities – i.e. those things that require more effort and investment. Also backed up by the in-depth interviews. Some quantitative data on amounts saved from the measuring and monitoring data to support this.	Measured
3.	One Change, a Canadian organisation which runs programmes through volunteers including the 'Simple Actions Matter' and 'Porchlight' campaigns to empower people to believe that simple actions matter and to make smart energy choices in their daily lives	One Change claim that by personalising energy conservation action at the community level and by providing a simple first step, people go on to do more things, and increasingly identify themselves with the action and its benefits. Since 2005, over 7,000 registered volunteers from 800 groups in 300 communities have been engaged to deliver more than 1.5 million light bulbs and carry the "Simple Actions Matter" message directly to doorsteps.	The One Change website quotes residents saying 'they will buy low energy light bulbs in future after being given a free one' as catalyst effects. They also cite evaluation data showing people exposed to the programme are more likely to use CFLs in the future; to consider energy-efficiency when buying other products; and to speak to others and encourage them to act.	Anecdotal
4.	Community Service Volunteers (CSV) Street Champions project	The Street Champion scheme operates across Birmingham and assists and supports residents who are concerned about their environment and want to help make	Some of CSV environmental street champions who were working on composting have reportedly moved on to promote other local environmental actions in their communities.	Anecdotal

Table 14 Practitioner evidence summary				
	Project / scheme / evaluation	Description of project or intervention	Catalytic effects found	Measured or anecdotal?
		improvements.		
5.	Spatial and temporal analysis of travel diary data collected during the State of California Telecommuting Pilot Project	Travel diary data and geo-coded trip data analysed to determine the impacts of telecommuting on household travel behaviour.	Not only do telecommuters cut their car use for commuting (which is the intended effect), but this behaviour change affects non-commuting trips as well. Once the individuals do not need to drive long distances to work, driving long distances for other purposes becomes less acceptable and they tend to shop more locally and shift to locally-based leisure. On telecommuting days, the telecommuters made virtually no commute trips, reduced peak-period trips by 60%, total distance travelled by 75%, and freeway miles by 90%. They also chose non-work destinations that were closer to home on both commute and non-commute days.	Measured
6.	DEMIA (Domestic Environmental Management in Action) in the EDF Energy Smart Metering Trial managed in conjunction with fuel poverty charity National Energy Action (NEA)	The project provided householders with a free environmental survey of their home which included the installation of basic energy efficiency measures such as draught proofing, hot water tank jackets, low energy light bulbs and reflective radiator panels. Householders then received a personal home energy action plan with energy reduction targets and key energy efficiency measures identified; as well as water saving devices and recycling boxes. Households were also encouraged to install smart meters and carry out ongoing energy monitoring. Participants (n= 70+ and a control group) were surveyed before and 12 months after the intervention.	Slight increase in the engagement of DEMIA households in the specified energy saving behaviours; the proportion of DEMIA households that reported reducing their energy consumption at home more than doubled from before the intervention; the results also suggest that DEMIA clients, since their involvement in the programme, are now more likely to engage in more sustainable means of shopping and waste management: marked increases were seen in those now purchasing eco-friendly products, composting, recycling materials other than paper and buying organically.	Measured – self reported by respondents
7.	Evaluator experience from focus groups/workshops (independent practitioner)	Focus groups and workshops on environmental issues.	A few people reported in workshops that the experience of seeing benefits from one pro-environmental behaviour (e.g. save money on water or energy bills by reducing use) made them willing to try others. However others had been discouraged when they hadn't seen obvious cost savings.	Anecdotal
8.	BioRegional Reclaimed – promotes and facilitates the use of reclaimed building materials	BioRegional works with demolition projects and with the salvage sector, as well as all types of construction projects. They source	Reported that its work to accredit suppliers to its construction buyers' club had encouraged some suppliers to look at their overall environmental performance, not just	Anecdotal

Table 14 Practitioner evidence summary				
	Project / scheme / evaluation	Description of project or intervention	Catalytic effects found	Measured or anecdotal?
		materials to meet the needs of these projects and offer advice on the use and specification of reclaimed materials.	that of their products – e.g. a supplier that has imposed a 56 mph speed limit on its vehicle fleet and put measures in place to reduce packaging.	
	2. New behaviours 'spin off' from existing behaviour			
9.	Study of waste prevention behaviours by Peter Tucker, University of Paisley	Survey of over 1450 households of waste prevention behaviours; questioned about whether they had increased such behaviour in past 2 years and reasons for doing so.	Over 80% claimed to have increased waste prevention activity in past 2 years. Survey asked about motivations - around 50% denied any external trigger - claimed behaviour was 'the next natural step'. These respondents had significantly stronger current behaviours than those who had been triggered to behave in other ways e.g. information from local council.	Measured – self reported by respondents
10.	Garden Organic's project SPAN (The Sustainable Production in Active Neighbourhoods partnership)	The study aimed to identify how community groups can be supported by the SPAN partnership to enable local people to become involved in sustainable food production and consumption; and to support, record and investigate each project.	Garden Organic claim that those people involved in growing their own food are far less likely to throw food away generally; also that SPAN had demonstrated that community food initiatives not only provide a focus for improving the local area but also encourage and empower people to take action on wider issues such as climate change and global sustainability.	Anecdotal
	3. Action A leads to action B and performing action B catalyses improved performance of action A (feedback mechanism)			
11.	Evaluation research by The Open University and Ipsos MORI of public attitudes and behaviour in relation to the Western Riverside Recycle Now campaign	Study of public attitudes and behaviour including household surveys (n=2000 and n=1300) and focus groups. Also analysis of local authority data to estimate capture rates of recyclables.	Increases were seen in the collection of those materials which had been collected prior to a change in service when new kerbside recycling schemes were introduced expanding the number of materials collected. The percentage of households claiming to frequently recycle those materials collected before the change increased by more than 17 points – and there was also supporting evidence from local authority collection data concerning quantities collected.	Measured
12.	Study of households participating in recycling schemes by Peter Tucker, University of Paisley	Survey and modelling study of households participating in recycling schemes.	Found that capture of paper for recycling generally rose by about 40% when paper only collections were converted to multi-material schemes.	Measured
13.	Evaluation by Somerset county council of the performance of their SORT IT recycling scheme	Somerset county council's SORT IT campaign replaced existing fortnightly dry recycling collections with weekly household food waste and dry recycling collections plus alternate weekly collections of refuse.	Reported increased amounts of dry recyclables collected as result of introducing food waste collections – dry kerbside recycling yields up by 58-79%. However several causal factors may be responsible – introduction of additional recyclables, AWC of refuse, increased frequency of dry recyclable collections and publicity.	Measured

Table 14 Practitioner evidence summary				
	Project / scheme / evaluation	Description of project or intervention	Catalytic effects found	Measured or anecdotal?
	4. 'Compensation' spill-over (e.g. I don't use my tumble dryer to 'make up for' driving to work)			
	none found			
	5. Situational spillover (e.g. from school to home)			
14.	Envision, a national education charity – working with 16 - 19 year olds in schools and colleges to develop their own social and environmental projects	Envision worked with older school students supporting young people to be 'green leaders' in their communities.	47% of student participants said it had a high or very high impact on their parents, mainly in terms of food purchasing; 50% on friends; and 25% on teachers, mainly on energy and paper use. The largest reported spill over was on other children in the school (67% said very high or high impact).	Measured – self reported by respondents
15.	Waste Watch's Take Home Action on Waste (THAW) programme – project to measure the effects of school-based waste education on household recycling levels in the local area	Waste Watch run training courses for the THAW programme which delivers waste reduction messages for school children to 'take home'. It is designed to prove that 'pester power' works. Key focus is on waste at home rather than at school. THAW seeks to work with every child in the school several times. Each classroom activity is followed up by a 'homework' assignment to actively introduce the sustainable waste message into the home environment. During its 2 ½ year lifespan the Rotherham THAW project worked directly with 6,705 children in 39 schools.	Children taking home messages from school activities to encourage parents to act to reduce, reuse and recycle. Qualitative evidence from children that their families had started or increased recycling since they had been in the programme. Quantitative evidence from recycling data for schools catchment areas showed that set-out rates and amount collected for recycling had increased in most areas – the amounts varied widely – but the overall trend was positive.	Measured – monitored and self reported by respondents
16.	SOLAR working with WWF, Peacechild and Ecoschools project – Exploring the role of schools in the development of Sustainable Communities	This action research project is concerned with effects of children learning about sustainability in schools and whether this spills over into influencing family and community. Focus on the role of children as agents of change. Spillover in this context refers not to identifying a specific behaviour that could lead to others (i.e. not a linear approach) but a multi-faceted approach of learning by one group (children) influencing another (parents/ communities). Results not yet published – due out end of April 2009.	Some evidence that children exposed to sustainability issues in schools did then encourage their parents to recycle and eat healthily; children's influence on family stronger than on community; questionnaire asked what impact parents felt that their children had on the their sustainable behaviour – not full results at present but from one school where 35 responses were received, 10 said the impact was high and 19 that they had some impact. The main reasons were raising the profile or reminding them to do things; main behaviours were saving electricity and recycling – and less so how they travel and what they eat. Interim results show that children are not able to influence things like holiday choices; building design and what car the family drives.	Measured by questionnaire survey of parents - only preliminary results available

Table 14 Practitioner evidence summary				
	Project / scheme / evaluation	Description of project or intervention	Catalytic effects found	Measured or anecdotal?
			However influence on family depends on social, cultural and economic factors and parents' attitude to valuing children's inputs; influence on community dependent on community context and sense of community.	
17.	Community Service Volunteers (CSV) Growing Gains project	Growing Gains aims to offer schoolchildren of all ages the opportunity to learn more about eating fruit and vegetables; and explore their relationship with the natural world through hands-on gardening activities.	Survey results (from small samples) show that half of parents in its Growing Gains schools project were asked by their children to buy more fruit & vegetables and to help out in the garden.	Measured – self reported by respondents
	6. Negative spillover			
18.	Evaluation study of residents in Devon carried out by Stewart Barr, Exeter University	Survey, focus groups and interviews of 200 residents in Devon concerning environmental behaviours.	The research found some evidence of negative compensational spillover. Attitudes and intentions towards reducing low cost flights remained negative amongst even those with strong pro-environmental views and who carried out other sustainable behaviours. There was some evidence that respondents justified flying – saying that their actions to recycle, using energy saving light bulbs and buying ethically sourced groceries were sufficient trade off.	Measured - focus groups, interviews and a survey
19.	People-centred eco-design research project carried out by the Open University (related to the microgeneration work described in section 1)	People-centred eco-design project conducted 90 telephone interviews of UK consumers who adopted or considered getting one or more established technologies of loft insulation, heating controls, condensing boilers, energy efficient lighting and solar water heating. On-line survey linked to a 2006 BBC TV programme on climate change produced nearly 400 responses from consumers who had adopted—or seriously considered but rejected—one or more of the above established technologies and/or innovative microgeneration technologies, including micro-CHP, domestic photovoltaics (PV) and micro-wind turbines, plus biomass (wood-fuelled) stoves; on-line energy newsletter responses from 50 energy professionals.	Focus of paper was on rebound effect - suggests that while there is clearly a rebound effect with energy efficiency measures, the level varies with the technology concerned. Conclusions: > 58% of adopters of loft insulation said the main benefit of loft insulation was a warmer house, while nearly a third said they also had lower fuel bills (29%) and/or energy consumption (31%); a small minority (4%) said they took the entire benefit in higher room temperatures, heating more of the house or heating the house for longer periods rather than lower energy consumption > about a third of users choose to leave CFLs switched on longer than incandescent lamps and/or have installed additional CFL lighting in the home, in the garden or for security. > Improved heating controls, when used properly, and condensing boilers appear to have a smaller rebound effect with about a half of adopters of these energy efficiency products noticing reductions in fuel bills and/or energy	Measured – self reported by respondents

Table 14 Practitioner evidence summary				
	Project / scheme / evaluation	Description of project or intervention	Catalytic effects found	Measured or anecdotal?
			consumption as well as a warmer house, and only about 10% saying they took the main benefit in heating more of their house, for longer, or to higher temperatures.	
7. Catalytic effect of awareness raising, education or social learning (not strictly catalytic behaviours but what many practitioners regarded as catalytic effects)				
20.	Effects of 'Be The Change Challenge' workshops with groups of children	One group had done the 'Be The Change Challenge' programme. The second had not received any additional programme on sustainable lifestyles. 'Be The Change Challenge' is a youth-led sustainable development Action Programme which aims to empower young people around the world to be the change they want to see in the world. Peace Child offers support and advice to young people to create and complete a variety of different projects serving the needs of their communities.	The interview data show a clear difference that suggests that the participants of 'Be The Change Challenge' are more likely to take actions towards sustainable lifestyles than those children who have not been involved in the 'Be The Change Challenge'	Measured – self reported
21.	National Trust energy outreach project – assessed as part of the EAF Evaluation carried out by Brook Lyndhurst		Reported that all teachers (in 8 schools) involved in its energy outreach project felt that the work with children had influenced their personal energy use in school and at home.	Anecdotal
22.	Home composting project in the North West of England cited in the Big Lottery Fund's Transforming Waste Programme evaluation	The home composting project provided considerable face-to-face advice and training to householders in order to foster understanding of composting and what householders can do to support it.	Found that the introduction of a home composting scheme raised participation in recycling. The project reported that kerbside recycling rates increased in those areas that had been targeted by the project. The implication of this was that the project's work on one waste type was having a knock-on effect on community attitudes to other wastes.	Anecdotal
23.	Cumbria Action for Sustainability (Eden LA21) – assessed as part of the EAF Evaluation carried out by Brook Lyndhurst		Noted that people getting involved in community action to fundraise to support the installation of insulation in community buildings had been an effective way of getting individuals to think about home energy issues.	Anecdotal
24.	Independent practitioner personal experience from focus groups/workshops	Focus groups and workshops on environmental issues.	People find out about other pro-environmental behaviours (e.g. buying organic meat and fish or cotton) in the course of doing one (e.g. buying organic veg) – personal experience.	Anecdotal

Table 14 Practitioner evidence summary				
	Project / scheme / evaluation	Description of project or intervention	Catalytic effects found	Measured or anecdotal?
8. Other evidence concerning catalyst effects:				
25.	Consumer Communications Channels Research Project - Energy Saving Trust (EST)	Research through group work and in-depth interviews on people's information journeys in finding out about energy saving measures through EST. Focused on how information leads to action, rather than one action leading to another.	Not specifically about catalysing behaviour. Explores how people get information in order to act but records where information led to action in some cases.	Measured
26.	Evaluation study of residents in Devon into a range of environmental behaviours in the home including water saving, energy use and waste management – by Stewart Barr, Exeter University.	Study of over 1000 households through survey delivered to residents which looked at relationships between pro-environmental behaviours carried out by different lifestyle groups.	Description of co-occurring behaviours – baskets of behaviours approach	Measured
27.	Research aimed at developing an understanding of how participation in different pro-environmental waste management behaviours might be related – by Peter Tucker, University of Paisley.	Investigates the correlations amongst the recycling of different materials, home composting and specific reduce/reuse behaviours for five communities across the UK. Also reviews related studies carried out in other communities and countries.	Explores relationships between behaviours – results show that whilst positively correlated, reduce/reuse and recycling behaviours may have fundamentally different roots and that home composting may be fundamentally different to both. The propensity for participation in both recycling and composting was found to be greatest amongst recyclers and composters of long standing, with relatively few new recruits practising both activities.	Measured
28.	Quantitative research by the Consumer Council for Water to determine consumers' attitudes to water use and water conservation	Large scale (n=2000+) face-to-face survey across England of consumers.	Comparison of attitudes / behaviour amongst metered and unmetered customers revealed a greater inclination amongst the former to undertake water-efficient activities. No evidence as to whether this demonstrated a catalytic effect on energy saving behaviour of having a water meter (i.e. metering leads to increased awareness and efficiency) or co-occurring behaviours (i.e. those with a greater inclination to conserve water install a meter). Most respondents, metered and unmetered, said that they would be more likely to reduce their water consumption if they had a display in the home that monitored their water usage and if they received information showing their use compared with the average user.	Measured

Appendix 4: Green and non-green questionnaire scores

Tables 15 and 16 below show the relevant portions of the recruitment and follow up questionnaires. Table 17 shows how the results were used to sub-divide the sample for analysis.

Table 15 Recruitment questionnaire (lifestyle questions)					
		Always	Most of the time	Occasionally	Never
How often do you...					
1.	make a conscious effort to buy organic and fair trade food?				
2.	leave your TV on standby overnight?				
3.	donate old clothes and household goods to charity?				
4.	walk or cycle for short trips instead of travelling by car?				
5.	choose the most environmentally friendly products when shopping?				

Table 16 Follow up questionnaire
Which of these would you say best describes your current lifestyle? (Please circle the one that most applies to you)
<ul style="list-style-type: none"> I don't really do anything that is environmentally-friendly I do one or two things that are environmentally-friendly I do quite a few things that are environmentally-friendly I'm environmentally-friendly in most things I do I'm environmentally-friendly in everything I do

Table 17 Categorisation of sample into green/non-green

Person	1. Choose most env friendly products?	Q1. score	2. Which applies?	Q2. score	Combined Scores	No. behaviours in category 'I always do'	Final score	Categorisation
P9	Most of the time	3	I'm env friendly in most things I do	4	7	17	24	Green
P1	Occasionally	2	I'm env friendly in most things I do	4	6	11	17	Green
P5	Most of the time	3	I'm env friendly in most things I do	4	7	10	17	Green
P3	Most of the time	3	I'm env friendly in most things I do	4	7	8	15	Green
P6	Most of the time	3	I do one or two things	2	5	10	15	Green
P13	Most of the time	3	I do quite a few things	3	6	9	15	Green
P11	Most of the time	3	I do quite a few things	3	6	8	14	Middle - exclude
P17	Occasionally	2	I do quite a few things	3	5	9	14	Middle - exclude
P2	Occasionally	2	I do quite a few things	3	5	8	13	Middle - exclude
P14	Occasionally	2	I do quite a few things	3	5	7	12	Middle - exclude
P15	Occasionally	2	I do quite a few things	3	5	6	11	Middle - exclude
P12	Always	4	I do quite a few things	3	7	12	19	Excluded due to inconsistent answers
P16	Never	1	I do one or two things	2	3	8	11	Non-green
P10	Occasionally	2	I do one or two things	2	4	6	10	Non-green
P7	Never	1	I do quite a few things	3	4	3	7	Non-green
P4	Occasionally	2	I do one or two things	2	4	2	6	Non-green
P8	Never	1	I do one or two things	2	3	3	6	Non-green
P18	Never	1	I do one or two things	2	3	0	3	Non-green

Appendix 5: Outline ideas for further research and development

The table below contains a number of outline suggestions for further research and development stemming from this research. The aim of all the suggestions below is to strengthen, test and verify the evidence in support of how the spillover process works and how it could be optimised among different audiences. The table contains a mixture of theoretical and action based research ideas, since there is little of either type of evidence. All the suggestions would have the potential to inform policy and communications by clarifying whether and how the idea of spillover can be built into existing and future campaigns.

Table 18 Outline suggestions for further research and development		
Area for further research	Description	Aim or objective
Multiple sorting procedure	Multiple sorting procedure with a larger, fully representative sample of participants.	To build on the findings of the pilot exercise; to extend and validate findings.
	Multiple sorting procedure based on the Defra segments.	To build on the findings of the pilot exercise and explore differences between people with different behaviour and attitude patterns in more detail.
	Multiple sorting procedure based on a wider set of behaviours.	To identify how pro-environmental behaviours are categorised in the context of a wider universe that includes other, day to day 'non-environmental' behaviours and habits.
	Combinations of the above; e.g. multiple sorting procedure based on a wider set of behaviours with the Defra segments.	To explore how different groups of people understand, perceive and categorise the pro-environmental behaviours in the context of a set of wider behaviours.
Cluster analysis on Defra/BMRB survey data	Re-run the same cluster analysis on the 2009 data.	To identify changes in behavioural patterns over the course of a year.
	Re-specify the cluster analysis based on the 'domains' identified by further multiple sorting procedure work.	To identify behavioural patterns within the domains identified by participants.
	Re-specify the cluster analysis based on different combinations of the variables; for example, combine different behaviours from different questions.	To identify the most common patterns of co-occurrence across previously unstudied 'domains' by creating different domains by combining different behaviours from different questions.
Other work with the Defra/BMRB data	Scoping study to identify the potential for structural equation modelling techniques to be employed with the data set; could include a single year's data or various years.	To apply some of the techniques found in the literature (e.g. Thøgersen, 1999) to representative UK data.

	Longitudinal qualitative work to accompany tracker survey.	<p>To gauge how constructs, attitudes, motivations, barriers and so on change over time, and to link this to the patterns identified within the tracker survey.</p> <p>To track patterns of adoption for individuals that can support cross sectional quantitative analysis of representative samples.</p>
Ethnographic approaches	‘Life story’ or narrative approaches to explore the experiences of early adopters of pro-environmental behaviours. See the work of Sarah Harder, University of York, for an example of good practice.	To better understand the internal and external conditions that have enabled ‘journeys’ through pro-environmental behaviours.
Action research based on the principles of the theories of spillover	Interventions designed to make pro-environmental links or common goals more salient.	To test whether this provides a basis for behaviour change via consistency theories. Interventions should involve baselining; evaluation over a period of time; and testing against a control group.
	Interventions based on the principles of learning by doing and self efficacy, at either the individual or group level.	To explore the subjective effects and the objective outcomes of learning by doing approaches.
	Research to test the effects of different behaviours on the self perception of different groups; and the outcomes of these changes in self perception in other areas.	To develop research designed specifically to test a particular formulation of the spillover hypothesis.
	Interventions to test the foot in the door approach. Could be based on the behavioural categories identified through further multiple sorting procedures. This could also incorporate a test of the timescales required for this type of process.	To develop evidence about whether this approach is effective; to identify the ‘sets’ of pro-environmental behaviours that are most conducive to this approach. These sets could include behaviours that are not pro-environmental.
	Interventions to test the relative values of ‘co-marketing’ different sets of behaviours for different audiences. Could draw on multiple sorting procedure work with the segments.	To identify the most successful ‘sets’ of pro-environmental behaviours. These sets could include behaviours that are not pro-environmental.
Existing or future projects	All action research projects to have an evaluation component to capture spillover effects.	To strengthen the action research evidence base and identify good practice.

Appendix 6: Summary of the expert workshop

This section provides a brief summary of the headline findings of the expert workshop, held on 11 March 2009 at Defra. The workshop was scheduled to coincide with the analysis phase of the project, once the desk and primary research were completed. 15 academic and practitioner experts³⁹ in the field of behavioural spillover were invited to a day long, facilitated workshop. The aim was to bring together the experience and insight of these experts to maximise the lessons learnt from the research.

The findings of the expert workshop have informed the analysis of the research data and section 6.4.1 contains a summary of one of the outputs of the day – ideas for further research in this area. Below is a summary of the headline findings of the day.

Disagreement about the existence of spillover effects (“Are we looking at an illusion?”)

The experts did not agree on whether reported spillover constituted a post rationalised attribution error or a plausible explanation of behaviour change. It was also suggested that we observe spillover as a function of the way we have defined it and defined the boundaries around behaviour and categories of behaviour. For example, in the field of health, it is not clear whether ‘smoking’ counts as a bounded behaviour or whether it is a series of behaviours such as ‘going to the shops’, ‘buying some cigarettes’, ‘going out for a drink’, ‘lighting up’ and so on. If we define spillover as transfer effects across behavioural boundaries, we need to be sure that the boundaries we have drawn are the right ones.

Disagreement about the process

- Among those who concurred that spillover exists, there was little agreement as to how the process might work.
- Thøgersen suggested a sort of ‘psychological’ spillover, involving, among other things, the antecedents of behaviour, including values. For example, it may be possible to activate certain values by encouraging or enabling participation in certain behaviours.
- Kaiser suggested that spillover is more likely to be ‘structural’: searching for causal paths is misleading, since the important thing about spillover is the structural, reciprocal relationships between the behaviours (see section 2.5.1 of the main report for details of Thøgersen’s and Kaiser’s published work).
- Several practitioners proposed that the main causes of spillover are often practical considerations; for example, realising that performing an action has saved you money and wishing to build on this success.
- It was also proposed that spillover may be ‘latent’ - introducing a new service or simply removing barriers may be a sufficient trigger.
- Spillover was perceived to be dependent on a ‘heightened state of preparedness’.

- Habits and unconscious behaviours are a key part of our behaviour patterns – there may be opportunities to harness automatic behaviours using situational retrieval cues.
- Making situations ‘value relevant’ (i.e. highlighting desired values) may help promote spillover.

Most of the experts agreed that defining ‘sets’ of pro-environmental behaviours can be problematic. One reason for this was the observation that there are many reasons why ‘travel’ is different to ‘waste’ over and above environmental constructs. Relationships between behaviours are based on various different criteria, only one of which may be a common environmental goal. Spillover could happen along any of these different dimensions of similarity.

Agreement that catalyst behaviours, if they exist, are part of a complicated context of behaviour and behaviour change

Despite widespread disagreement about many aspects of spillover and catalyst behaviours, the experts broadly agreed that there were no easy answers or ‘silver bullets’. However, they also agreed that knowledge of how the process might work may enhance other interventions or campaigns.

A strong concern emerged that spillover interventions could be overly focused on starting with small, insignificant behaviours. Although this was not an assumption of the current research, the concern remained that relying on spillover might be insufficient to achieve the kinds of behaviour change required to make any substantive difference to climate change and other environmental issues. Some experts took a strong view that, until we can be sure that interventions aiming to trigger spillover do not have negative spillover effects (for example, performance of a behaviour such as recycling providing an ‘alibi’ further not performing other behaviours), we should proceed only with extreme caution.

Overall, it was broadly agreed that further research should be undertaken to clarify the nature of behavioural spillover processes and the context in which they may occur, but that this should be part of a broader approach to behaviour change, and should be always mindful of the potential risks. These potential risks include negative spillover at the individual level, and at the broader level, a failure to address the deeper and more structural changes that are required for a transition to sustainable lifestyles.

Appendix 7: Expert workshop delegate list

Table 19 Expert workshop delegates (March 2009)	
Name	Position/expertise
Jane Ogden	Head of Health Psychology, University of Surrey
Florian Kaiser	Associate Professor of social and environmental psychology at Eindhoven University of Technology
John Thogerson	Professor of economic psychology, Aarhus School of Business, University of Aarhus
Stewart Barr	Senior Lecturer in Human Geography, University of Exeter
Penny Sturgess	Head of Communities, Global Action Plan
Kathryn Rathouse	Independent evaluator
Tom Crompton	WWF policy and research
Niamh Carey	WWF practitioner
Andrew Darnton	Independent researcher
Rachel Huxley	Operations Manager, Peterborough Environment City Trust
Bas Verplanken	Professor of Social Psychology, University of Bath
Birgitta Gatersleben	Lecturer in environmental psychology, University of Surrey
Julie Barnett	Senior Research Fellow in Psychology, University of Surrey
Christine Thomas	Senior Research Fellow, Open University
Lucy Reynolds	National Social Marketing Centre

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